the OIL AND GAS JOURNAL
AUGUST 4, 1958

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BY H. C. SCHUTT
AND
A. R. MATTIOLI

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3 new applications get longer life and minimum maintenance using Dodge pillow blocks with Timken® bearings

PICTURED below are three applications where Timken bearing equipped Dodge pillow blocks stay on the job with little attention under tough conditions. Their tapered design lets Timken® bearings take *both* radial and thrust loads in any combination. And full-line contact between rollers and races provides extra load-carrying capacity. Wear is reduced, maintenance is cut to the minimum.

Cutaway view shows the Dodge All-Steel pillow block with Timken bearing mounting. Of special design, the bearing has a tapered bore with self-aligning spherical outer surface —never needs adjustment.

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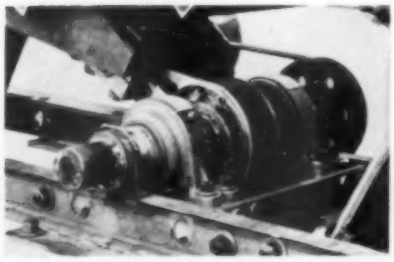

Timken bearing-equipped Dodge All-Steel pillow block used in a vibrating conveyor.

Timken bearing-equipped Dodge Type "E" pillow block used in sand and gravel plant.

Timken bearing-equipped Dodge "Special Duty" pillow block as used on fine paper machine lineshafts.

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TAPERED ROLLER BEARINGS ROLL THE LOAD

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Aug. 4, 1958

Oil industry is sure to feel steel price increases:

Steel industry's hold-the-line on prices finally gave way. Oil men can expect to pay more for their steel goods before long.

The price hikes, expected since July 1, started last week when Armco Steel broke the ice. Armco upped the tab about $4.50 a ton, chiefly on sheet and strip mill products.

That cracked the price front wide open. Three others—Republic, Jones & Laughlin, National—quickly followed suit.

Initially the increases apply chiefly to sheet and strip mill products. But they are expected to spread soon to principal oil country products—line pipe, tubular goods. They've been included in all previous steel price boosts.

Oil men have been braced for the hike since July 1 when steel workers were given a 20-cents-an-hour wage increase.

If the $4.50 increase becomes general, oil men will pay about $27 million more for steel goods during the next year.

Congress is winding up this session. Oil got off light. It could have been worse (p. 54).

Looking back: There was a lot of talk but not much action on matters affecting the industry. Lawmakers did:

...Grant statehood to Alaska. It sets up an expected big oil rush.

...Repeal taxes on freight. That includes movement of oil and products by pipeline, railroad, and truck.

...Permit oil leases on lands under navigable inland waters in Alaska still held by the federal Government.

...Provide for congressional veto of withdrawals of large tracts of land by military agencies. They also barred the military from oil exploration except on naval petroleum reserves.

Looking ahead: The industry can relax and breathe easier—until the next session.

Oklahoma sweet crude prices moved up from 5 to 15 cents last week, mostly restoring cuts made last spring.

Prices in the Rocky Mountain region and along the Gulf Coast still are undergoing some adjustments. But it now appears that recent crude price cuts may have run their course. Reasons: Relative tightening of the market, and the fact many

refiners are in the market for spot purchases of crude.

Such price shavings worry producers. While they start out with local effects only, they're apt to trigger a chain reaction. Other crudes, even in distant fields, may have to meet the new low price to stay competitive in common markets.

But, whether the general trend is up or down, you can expect an increasing number of these variations from general gravity price scales. Factors now growing in importance are location and quality of individual crudes.

Refiners are getting far more choosy about specifications for crude. Even minute percentages of certain impurities, such as metals and organic chlorides, can poison the catalyst in a cat reformer. This is causing refiners to put more price premiums or penalties on specific crudes.

First-half profits as revealed in oil-company reports on second-quarter business are off sharply from last year. This is no surprise to oil men.

They've already pegged 1958 as a low-profit year compared with 1957. Most still expect profit margins to improve in the last half and leave 1958 in a better position than at present.

The brighter economic outlook has caused Continental Oil to increase this year's capital commitment budget. It was upped $7.5 million, to a total of $98 million. It was $110 million last year.

First half capital expenditures were $36,230,000. Conoco President L. F. McCollum says increased expenditures for production account for the larger, second-half budget.

San Juan basin was the exploration hotspot of the Four Corners area the first half of this year (p. 131).

There were 18 new field discoveries in the basin in northwestern New Mexico. They gave that part of the state a 28% success ratio.

Outlook: Continued high-level development and exploratory drilling in next few months. Particular emphasis will be placed on drilling to the deeper Dakota-Cretaceous sands.

The Illinois basin last week picked up one of its biggest strikes of the year.

It's a Gallatin County wildcat, the Louis Kapp 1 Logsdon, 4 miles north of Shawneetown. It was completed flowing 600 bbl. daily from Aux Vases-Mississippian. The twin well to this discovery, 1-A Logsdon, flowed 30 bbl. per hour from Waltersburg sand. It was a new pay for the area.

The Paradox's tricky Bluff Bench area in southeast Utah may prove to be one of the big members of basin producers. Carter Oil's 8 Bluff Bench was completed for a flow of 264

bbl. of 40.6° gravity oil per day through ⅝-in. choke. Flow is from perforations at 5,344-76 ft. It is 1½ miles southeast of the discovery well.

Mountain Fuel Supply has what may be the biggest gas well yet in Green River basin of southwestern Wyoming. It's an offset to the 4-year-old Trail Unit discovery. It blew out last week with an estimated 50,000 M.c.f. of gas daily from the Mesaverde-Cretaceous. Operator has the well under control and shut in.

Tighter alkylate market has been created by military orders for avgas in the Middle East crisis. This may temporarily slow down refiners' drive to improve quality of their premium gasoline.

Alkylate is an important component of avgas.

It also is a key component in refiners' plans for motor fuel. They have been blending it into premium gasoline to raise their motor-octane ratings. This trend was scheduled to increase.

The development on a large scale is still in the books but may have to wait until military demand is satisfied and aklylate becomes more readily available (p. 49).

In this connection the word from Detroit is that fuel economy will get the play in 1959 car models.

Compression ratios will edge up gradually, but no new breakout from present top of 10½:1 is anticipated.

Economy will be accomplished with leaner carburetion and hotter engines. Both will promote higher octane requirements.

The breakout in premium grade octanes on Pacific Coast removes a deterrent to higher-requirement cars next year. In current models the West was the limiting factor because it lagged the rest of the country in top octanes. Now, premium brands in the 98-100 octane class are available there. Their sensitivity is still relatively high. But some improvement in motor ratings will give Detroit more leeway in boosting 1959 car requirements.

Another major oil company is making a stab at multigrade gasoline marketing.

Imperial Oil has installed four multigrade pumps at Toronto service stations in a thorough marketing test. They dispense nine grades. Sun, first in the multigrade market, dispenses six. Imperial product ranges from less than 90 octane to over 100.

Consumer reaction is being studied in test which will run into next month. Study will determine whether Imperial adopts or rejects multigrade device.

Several U. S. companies are looking at the multigrade pump. None has yet indicated it will adopt it.

New micro-mesh sieves with precise square openings ranging from 15 to 105 microns are now available to refiners for particle-size studies on fluid cracking catalysts.

The sieves are made by electroforming nickel. Shell Development Co. originators say they are better than woven wire on two counts: They extend the lower range limit of 44 microns, and they improve reliability.

Argentina, hard-pressed to pay for oil imports, is taking big steps to relieve the pinch (p. 70).

The plan: Contracts with foreign companies to develop Argentina's own oil reserves.

Only opposition to the plan heard in ultranationalist Argentina was political and considered minor.

Reports are there's a move afoot to build a new refinery in the Lake Maracaibo area. It would process crude from some of the new concessions that are beginning to produce.

Newcomers are obligated to refine 15% of production in the country. None of them have refineries in Venezuela. One large, complete refinery in which several had an interest might be more attractive to companies than several small ones.

Proposed Gulf Pacific Pipe Line from South Louisiana to California isn't a dead issue (OGJ, May 19, p. 101). Renewed efforts are being made to firm up the plans.

Initial proposals for gas supply in the Bastian Bay area were not acceptable. A new formula may be tried. It calls for the purchaser to take over development drilling and production as well as processing responsibility.

Government ownership in the gas industry continues to edge ahead.

That's shown in figures compiled by AGA. Since January, 1957, 64 new municipal gas companies are in business, bringing the total to 515.

Municipal companies had a customer increase of 16.1% during that period. The industry had only 3.2%. Revenues of municipal companies increased 17%, while the industry's went up 7.4%.

Of industry interest is a federal court ruling exempting a gasoline jobber's employes from federal wage-hour act. U. S. Fifth Circuit Court of Appeals ruled the jobber was not engaged in interstate commerce.

Employer was Richfield Oil jobber operating in northeast Florida. Labor Department's contention: Employes were engaged in interstate commerce because they handled goods shipped from outside the state. The court rejected this argument.

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-class mail privileges authorized at Tulsa, Okla. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

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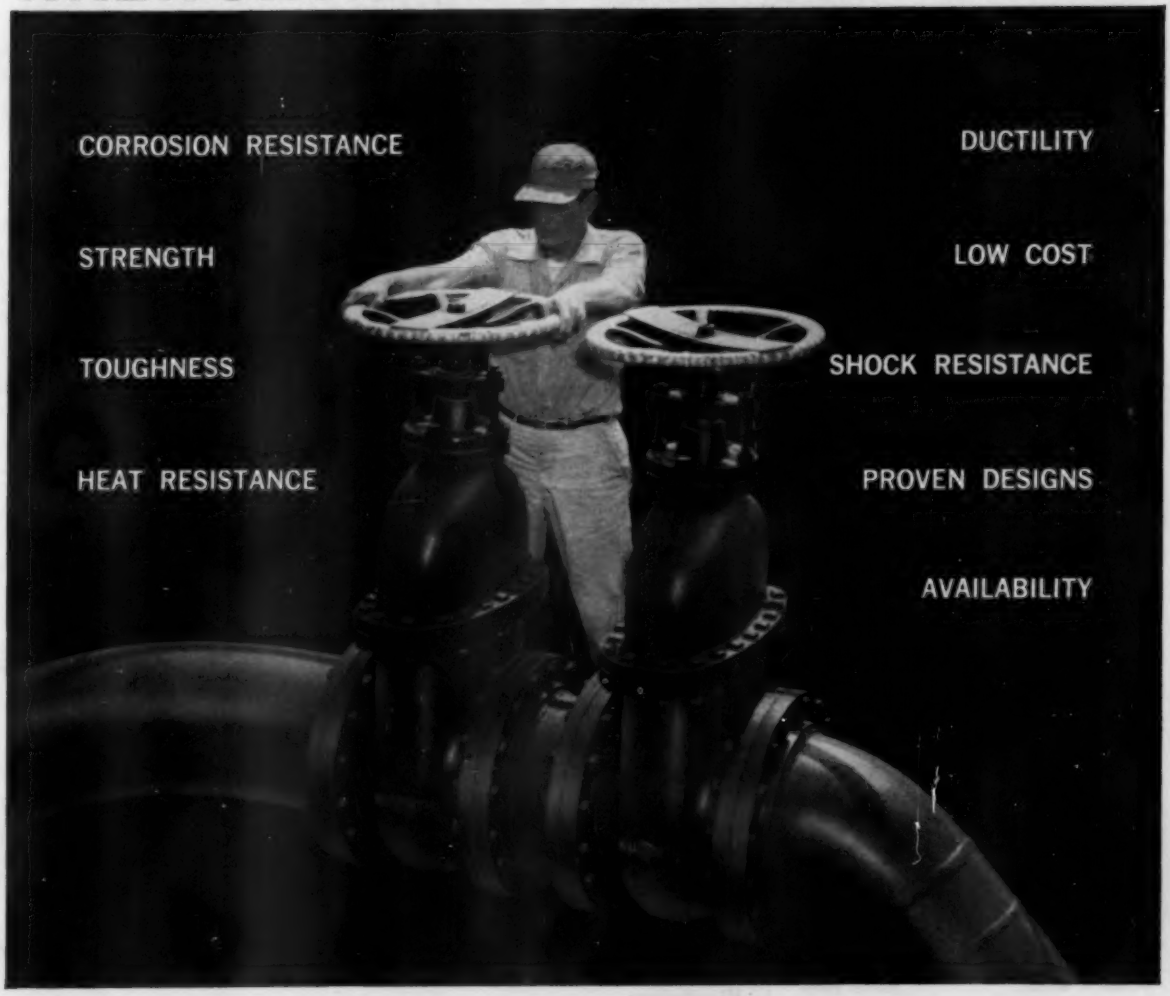

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the OIL AND GAS JOURNAL

AUGUST 4, 1958 • VOLUME 56 • NUMBER 31

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By H. C. Schutt and A. R. Mattioli

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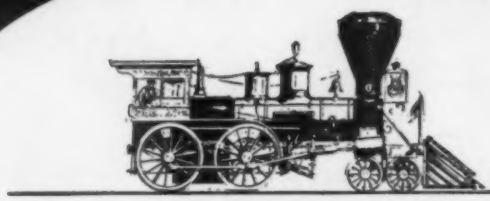

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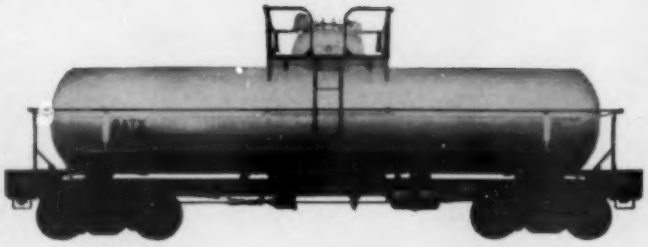

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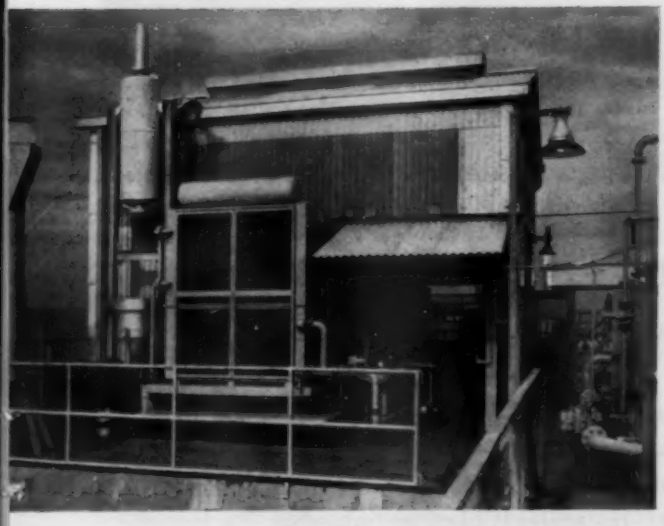

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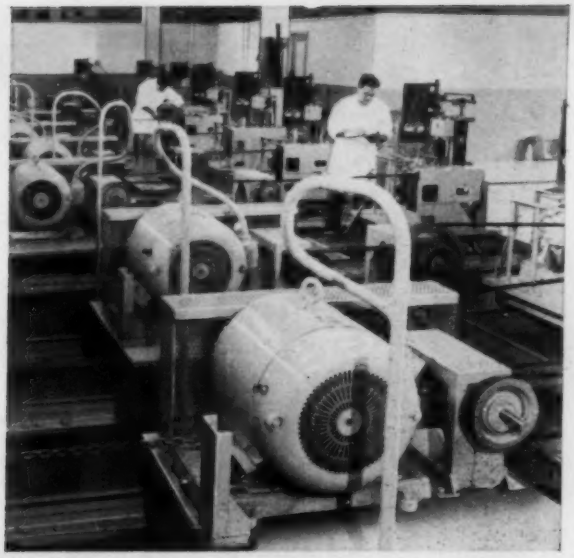

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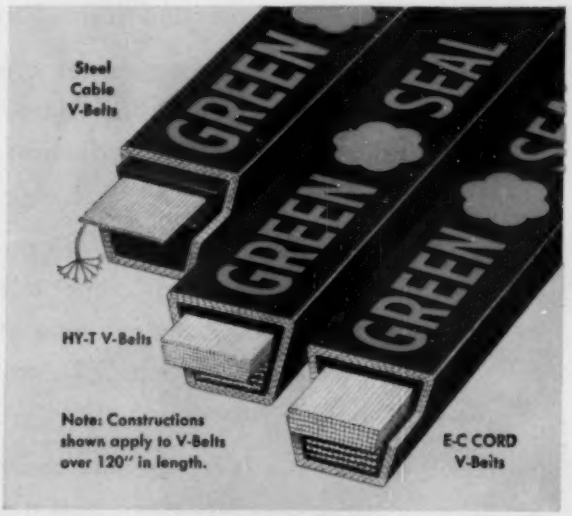

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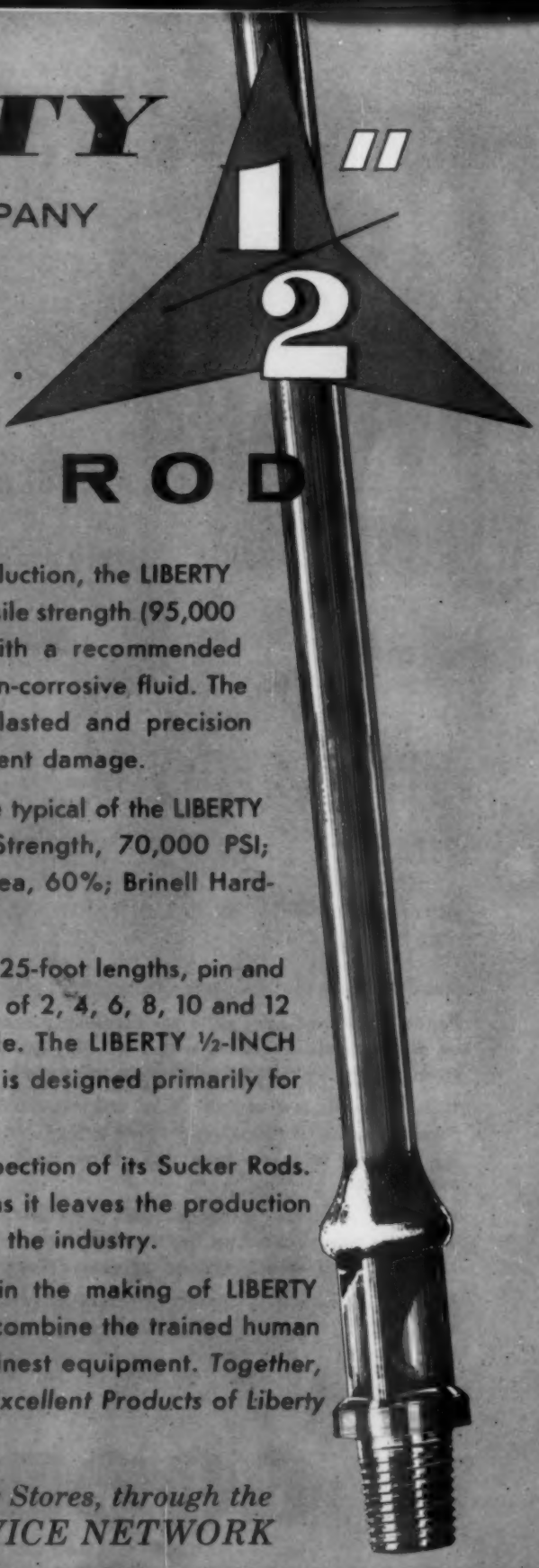

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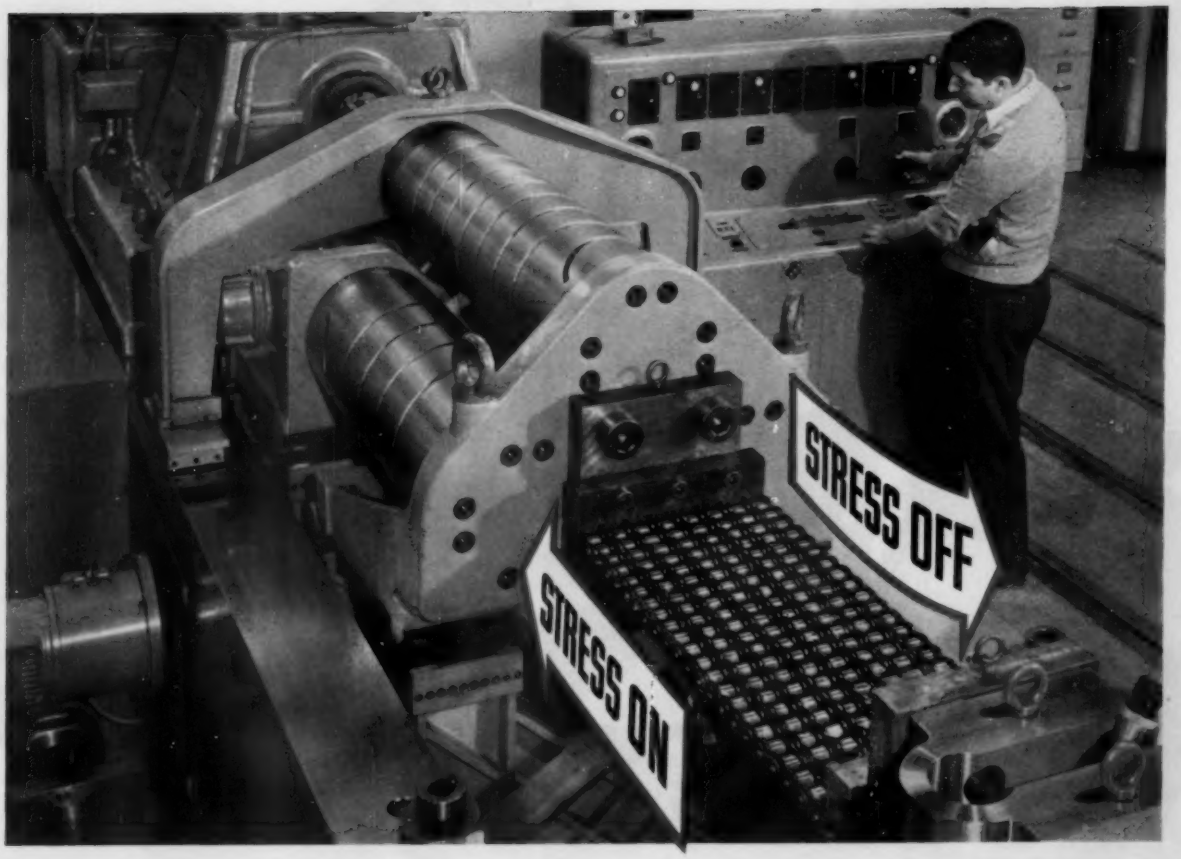


65 tons of cyclic tension

Lab test proves the unexcelled *fatigue strength* of LINK-BELT roller chain with FR® FATIGUE RESISTANT

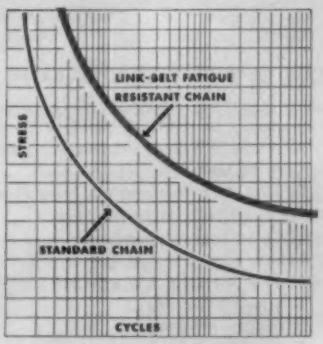
The equipment you see here—largest of its type known to be in operation in roller chain testing—enables Link-Belt to test and rate the largest-pitch, multiple-width chains used on today's drilling rigs. Its rapid "stress-on, stress-off" action duplicates the toughest conditions of rig operation at a greatly accelerated pace. It proves conclusively (see chart) the superior *fatigue resistance* imparted to roller chain by the FR process.

From such unequalled facilities for research, production and quality control comes roller chain unsurpassed in its ability to withstand the tremendous tensions of drilling service. In fact, Link-Belt can state without reservation: *No other roller chain has greater capacity to withstand the smashing impacts and tortuous stresses met in day-to-day drilling.*

FR and many other "extras" are standard with all Link-Belt oil field roller chains which can be applied to any type of drilling rig. Send for Catalog 2880.

U.S. Patent No. 2,517,497

THIS IS FR. By compressing metal around pitch holes, Link-Belt greatly strengthens the critical sidebar areas most vulnerable to fatigue failure and greatly increases the chain's *dynamic strength*



LINK-BELT

ROLLER CHAINS & SPROCKETS

14,928

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

THEY KNOW PUMPS
THEY KEEP PERFORMANCE RECORDS
THEY STANDARDIZE ON GASOS

Fig. 3671 — 2½" to 3½" x 6 Triplex Plunger Pump. Capacities of 191 to 375 barrels per hour at working pressures from 1575 to 800 PSI.

Pipe line engineers are practical men. They base their decisions on facts, not impressions . . . and it's facts that have led so many of them to adopt GASO Pumps as standard in their capacity range. *Recorded* facts which show that GASOS consistently outperform and outlast ordinary pumps, and therefore deliver more value per dollar. Ask for latest catalog.

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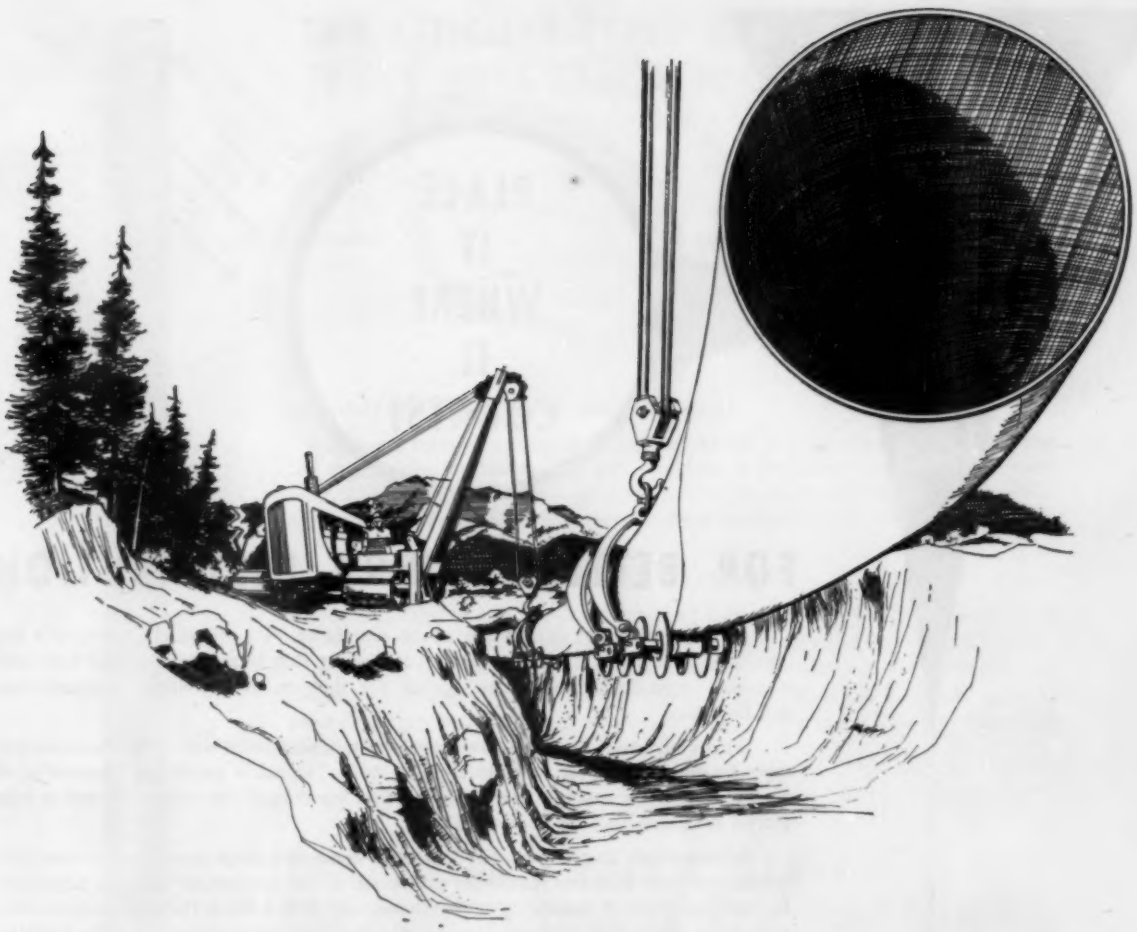
for every oil industry need

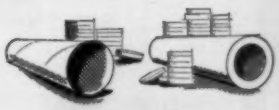


How you can keep costs down with ARMCO LINE PIPE

Here's a typical example of the savings possible with Armco Welded Steel Pipe: 100 feet of Armco 12¾" x .188" wall pipe costs *about $7 less* than 100 feet of 10¾" standard weight pipe. Yet you get almost *50% more flow area,* and about *20% less weight.* Shipping and handling costs are lower.

You'll find that piping costs are lower when you choose the right diameter and wall thickness for each job from Armco's 132 different diameter-wall thickness combinations. Diameters range from 6 to 36 inches; wall thicknesses from $\frac{9}{64}$- to ½-inch.

Write us for helpful information related to your line pipe problems. Armco Drainage & Metal Products, Inc., 5578 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.



LOWER COST

MORE FLOW AREA

LIGHTER WEIGHT

ARMCO WELDED STEEL PIPE

ARMCO®

FOR BETTER SLURRY DISTRIBUTION

Maintaining equal distribution of the cement slurry pumped into the well is the important part of oil well cementing . . . cementing that helps provide your well with maximum long-lasting protection against the dangers of corrosion, contamination and blowout.

That's why your Halliburton cementing job is performed with specially-developed tools designed to provide uniform annulus area . . . to aid in preventing channeling of cement behind the casing . . . to facilitate better bonding of the cement . . . and to help extend the producing life of your well.

Halliburton's uniform custom-controlled cementing helps provide maximum protection for your well and maximum protection of the investment that you have in it. For all your oil well cementing requirements, call HALLIBURTON, the organization with more down hole cementing experience than any other company in the industry.

NOTE THE FEATURES OF THESE HALLIBURTON TOOLS DESIGNED FOR BETTER WELL PROTECTION . . .

S-3 CASING CENTRALIZER

HALLIBURTON'S
S-3 CASING CENTRALIZER

The S-3 Casing Centralizer, with heat-treated lap-welded springs, minimizes channeling, aids in uniform placement of cement around casing. Designed to give positive centering even under the most difficult conditions. Hinged for quick, easy installation as casing is run. Heavy Duty and Slim Hole Centralizers available for special applications.

HALLIBURTON'S
VISE-LOK LIMIT CLAMP

A new method of installing Recipo Wall Cleaners, Casing Centralizers and Cement Baskets on casing at selected spacing without welding of lugs or other limiting devices. Locking force is created by special file-hard gripping disc slips inside the precision forged steel ring and forced against the casing by taper pins driven in from behind. Hinged design for easy installation.

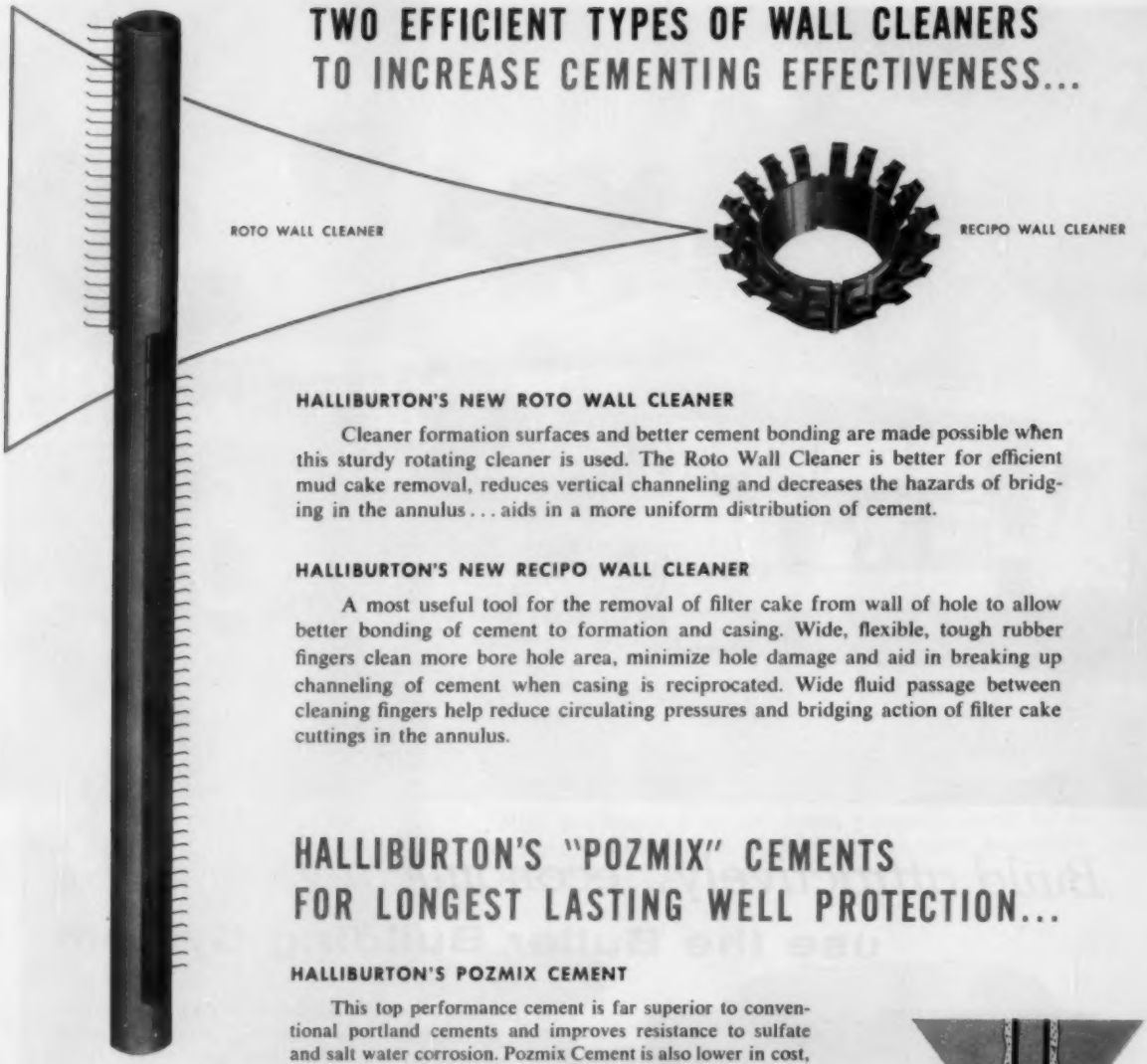
HALLIBURTON'S
SOLID SET SCREW LIMIT RING

Another economical and dependable method of installing auxiliary equipment on casing without welding lugs or rings. The Solid Set Screw Limit Ring does not equal the load-carrying capacity of the Vise-Lok Limit Clamp, yet its performance surpasses most other makes of non-weld limit rings or stop collars.

SOLID SET SCREW LIMIT RING

VISE-LOK LIMIT CLAMP

TWO EFFICIENT TYPES OF WALL CLEANERS TO INCREASE CEMENTING EFFECTIVENESS...



HALLIBURTON'S NEW ROTO WALL CLEANER

Cleaner formation surfaces and better cement bonding are made possible when this sturdy rotating cleaner is used. The Roto Wall Cleaner is better for efficient mud cake removal, reduces vertical channeling and decreases the hazards of bridging in the annulus... aids in a more uniform distribution of cement.

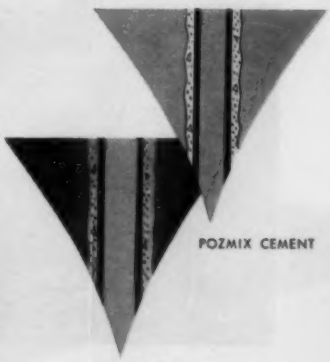
HALLIBURTON'S NEW RECIPO WALL CLEANER

A most useful tool for the removal of filter cake from wall of hole to allow better bonding of cement to formation and casing. Wide, flexible, tough rubber fingers clean more bore hole area, minimize hole damage and aid in breaking up channeling of cement when casing is reciprocated. Wide fluid passage between cleaning fingers help reduce circulating pressures and bridging action of filter cake cuttings in the annulus.

HALLIBURTON'S "POZMIX" CEMENTS FOR LONGEST LASTING WELL PROTECTION...

HALLIBURTON'S POZMIX CEMENT

This top performance cement is far superior to conventional portland cements and improves resistance to sulfate and salt water corrosion. Pozmix Cement is also lower in cost, easier to pump, easier to perforate, less permeable and more durable. It has an enviable record of success in thousands of cementing jobs. A wide variety of chemical additives provides precision control for a wide range of cementing applications.

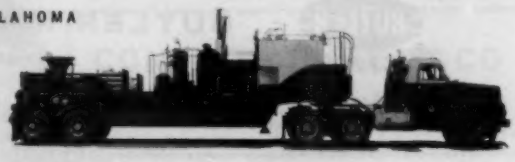


HALLIBURTON'S POZMIX 140...
THE LEADING CHOICE OF THE INDUSTRY

Developed for use in deep hot holes, where temperatures range from 140°F to 400°F and higher, Pozmix 140 is excellent for long strings and liners. Consists of Pozmix, lime and set control additives that meet individual well requirements. Sets to a dense durable product that provides year-after-year casing protection.

HALLIBURTON CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA



284 SERVICE CENTERS...
JUST MINUTES AWAY FROM YOUR WELL

Build attractively...economically

use the Butler Building System

The savings the Butler system of building effects over traditional building methods often more than pays for the stone, glass or other materials needed to create a distinctive building that will favorably impress your customers and neighbors.

This distinctive supply house was created economically by using the same system of building used to erect low-cost Butler metal buildings in oil fields from Canada to the Gulf of Mexico.

The same mass-produced, pre-engineered structurals form the load-bearing skeleton. The same precision-made, die-formed metal panels form the weather-tight, fire-safe roof. These standardized components permitted substantial savings in engineering and construction time, materials and labor. Economical, nonload-bearing curtain walls of glass and brick were used to create a distinctive exterior.

Interiors are spacious. Butler's clear-span, rigid-frame construction provides column-free interiors, unobstructed overhead space from floor to roof peak.

Get the full story on these and the many other advantages the Butler system of building offers over traditional construction methods. Contact your Butler Builder. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write direct.

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BUTLER MANUFACTURING COMPANY

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YOUR DRILLING DOLLARS GO FURTHER WITH

..FIELD PROVEN

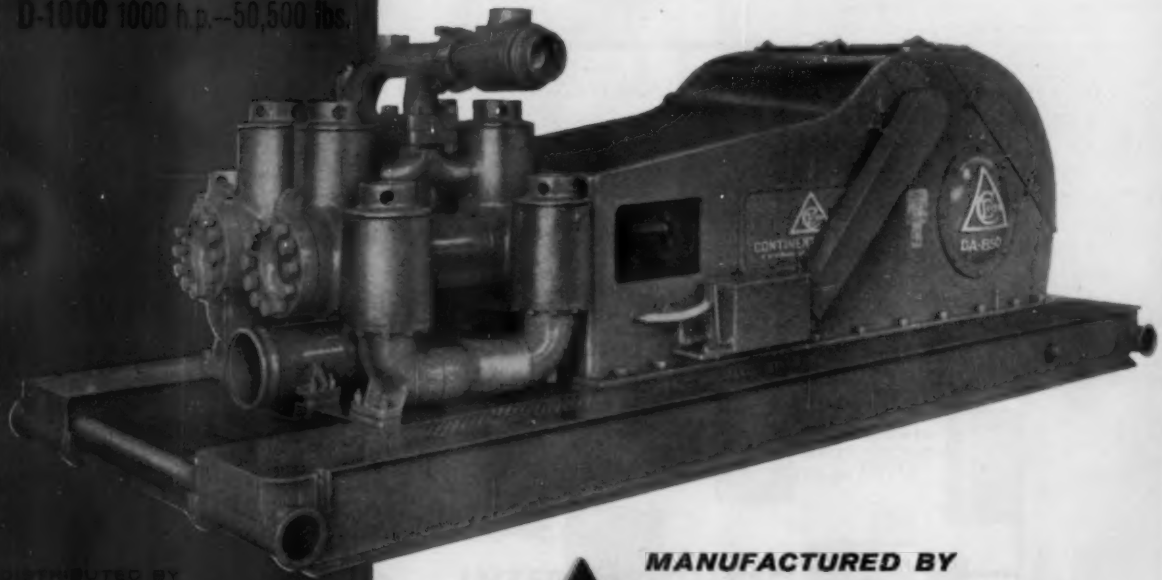
CONTINENTAL-EMSCO "D" Series Slush Pumps

No *wasted* dollars here. Low weight of these pumps cuts transportation costs . . makes them easier to handle around the rig for faster spudding-in. Lightweight steel plate construction replaces bulky, heavy castings.

Maintenance downtime is greatly reduced. Daily adjustments are not necessary. Lubrication is completely automatic, and greasing is not required. Patented "exposed" liner design helps prevent liner washouts, since packing leaks can be spotted immediately . . long before damage can be or has been done.

Six models help cut initial investment by providing a range of sizes to meet all drilling conditions at the lowest possible cost.

High performance of "D" Series pumps . . proved by years of drilling in the oil fields of the world . . assures penetration at its fastest rate.



These six models cover all conditions from light portable rigs to high-pressure deep well drilling

D-175 175 h.p.—10,700 lbs.
D-300 300 h.p.—16,900 lbs.
DA-500 500 h.p.—28,000 lbs.
D-700 700 h.p.—37,500 lbs.
DA-850 850 h.p.—49,090 lbs.
D-1000 1000 h.p.—50,500 lbs.

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SP-802

From the Wyoming oil fields to the "Vinegarroon" in the Gulf of Mexico Cutler-Hammer motor control sets the pace

Cutler-Hammer Three-Star Oil Well Pumping Control provides completely automatic pumping service day after day . . year after year.

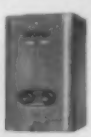
The Vinegarroon, built by R. G. LeTourneau, Inc., represents the most advanced engineering in mobile off-shore drilling platforms . . . and Cutler-Hammer Three-Star Motor Control is the standard control equipment.

Experienced engineers in the oil industry know the true importance of dependable motor control. Not only must it direct and protect the operation of all electrically driven machines and equipment used throughout the industry, but it must do so even when subjected to the ravages of blistering heat, choking dust, driving rain, sleet and snow, and corrosive salt-spray. Demanding conditions such as these put much meaning into the fact that more Cutler-Hammer Motor Control is being supplied to the oil industry than ever before.

Whatever your requirement for motor control may be, be sure you get the very best . . . Cutler-Hammer Three-Star Motor Control. It's star studded with extra features which guarantee exceptional performance and lasting dependability, at no extra cost. For further information write Dept. Q275, CUTLER-HAMMER Inc., Milwaukee 1, Wis.

For extra dependability at no extra cost . . . specify

CUTLER-HAMMER CONTROL C-H



GENERAL PURPOSE CONTROL

HEAVY DUTY SAFETY SWITCHES

COMBINATION STARTERS

REDUCED VOLTAGE STARTERS

OIL WELL PUMPING CONTROL

UNITROL

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Cut fuel bills up to 50%

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When your jobs call for a tractor to go . . . go . . . go day in and day out, all season long, you can make a big cut in fuel costs with an International 350 Diesel. That's because diesel fuel costs less and you use less of it. Lower fuel consumption is especially noticeable on jobs involving intermittent and part-load operation—such as loader work, and trenching or excavating with a backhoe.

And it's a BIG tractor! 49 engine hp delivers over 5,800 pounds pull at the drawbar, or similar push for dozing. There's up to 1,000 pounds greater built-in weight than usual to tractors of this power class. This greater strength means *stamina* to stay on the job in the most rugged service. Power steering is available optionally to give you top driving ease.

International tractors are available with unit-matched International Pippin and International Wagner loaders and backhoes.

Proof on the job! Ask your IH Dealer to demonstrate. Hold your watch on a measured amount of fuel in the tank, see how an International 350 Diesel can cut your tractor operating costs. For catalog, write International Harvester Company, Dept. OGJ-8, P. O. Box 7333, Chicago 80, Ill.

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International Harvester Products pay for themselves in use—Farm Tractors and Equipment . . . Twine . . . Commercial Wheel Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois

Howard Williams, driller, says, "We've had no trouble with Tiger Brand Lines—they've got the stuff to last."

Helmerick & Payne Rig No. 38 drilling with 7500 feet of Tiger Brand Rotary Drilling Line.

"We get better service from this wire rope than any other make,"

says **Howard Williams,** driller from Helmerick & Payne, Inc.

—It's Tiger Brand, of course

This rig was drilling in Garvin County, Oklahoma, when these photographs were taken. They were using a 7500-foot, 1¼" 6 x 19 USS American Tiger Brand Rotary Drilling Line with wire core.

This is the line that has set some of the highest ton-mile records in the oil fields. The driller, Mr. Howard Williams, said, "We've had better service with American Tiger Brand than with any other rope we ever used. It spools easy and we seldom have to add lubrication."

Helmerick & Payne, Inc. have used Tiger Brand Rope for many years. They operate more than twenty rigs. By following recommended cut-off practices and taking proper care of the rope, they get maximum service and low wire rope costs.

You can get USS American Tiger Brand Wire Rope from leading distributors throughout the oil fields. Try it next time. You'll save money.

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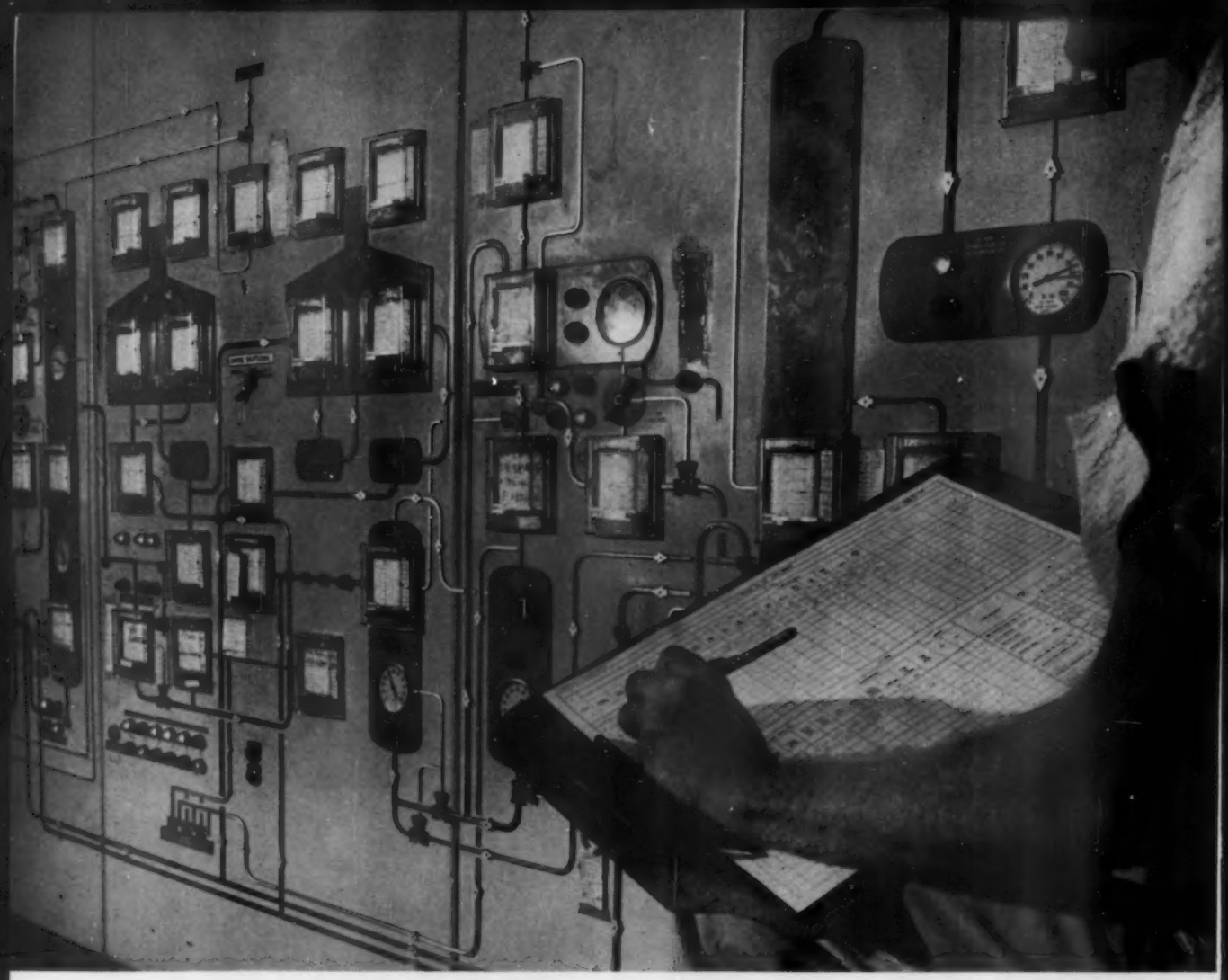
American Steel & Wire Division of USS **United States Steel**

Columbia-Geneva Steel, San Francisco • United States Steel Export Company, Distributors Abroad



Typical Air-Operated Instrument Panel

To keep down-time down . . .

Come to Kemp

Kemp Oriad Dryer protects compressed air operated control instruments in Seaboard Oil's Powell, Wyoming plant. Dryer, operating 24 hours a day, seven days a week requires only routine maintenance.

A Kemp gas dryer in your operation can put an end to many costly shut-downs by protecting air-operated instruments from corrosion and freezing or jamming . . . efficiently drying inert gases for purging and blanketing . . . or drying atmospheres and process gases in hundreds of other applications. Operations are faster and safer, with better quality control and frequently reduced costs.

And Kemp dryers, operating on the dynamic drying principle, are noted for dependable operation. Rugged Kemp dryers will do your drying job around the clock, month after month, without stoppages or major maintenance. Kemp design reduces utility and operating costs, uses desiccants more efficiently, and eliminates process gas contamination. Units dry to lower dew-points to give your processes and instruments highest possible protection.

Call your Kemp Representative, listed in the Chemical Engineering Catalog, for detailed information and a no-obligation survey of your dryer needs. Or write direct, for Bulletin D-100. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

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ONLY SIKORSKY HELICOPTERS ARE FULLY PROVED IN HEAVY-PAYLOAD COMMERCIAL SERVICE

Only Sikorsky helicopters have thoroughly proved their versatility and reliability with years of commercial service carrying heavy loads.

Shuttling crewmen and supplies to offshore oil rigs, eliminating expensive and time-consuming road-building through jungles or mountains, or in countless other demanding jobs, Sikorsky S-58s and S-55s have speeded the operations of a number of vital industries.

Sikorsky helicopters have performed such varied tasks as pouring concrete from the air, placing heavy steel transmission towers into position . . . airlifting drilling rigs with personnel and supplies into jungle sites . . . or moving quantities of heavy machinery to factory rooftop operating positions.

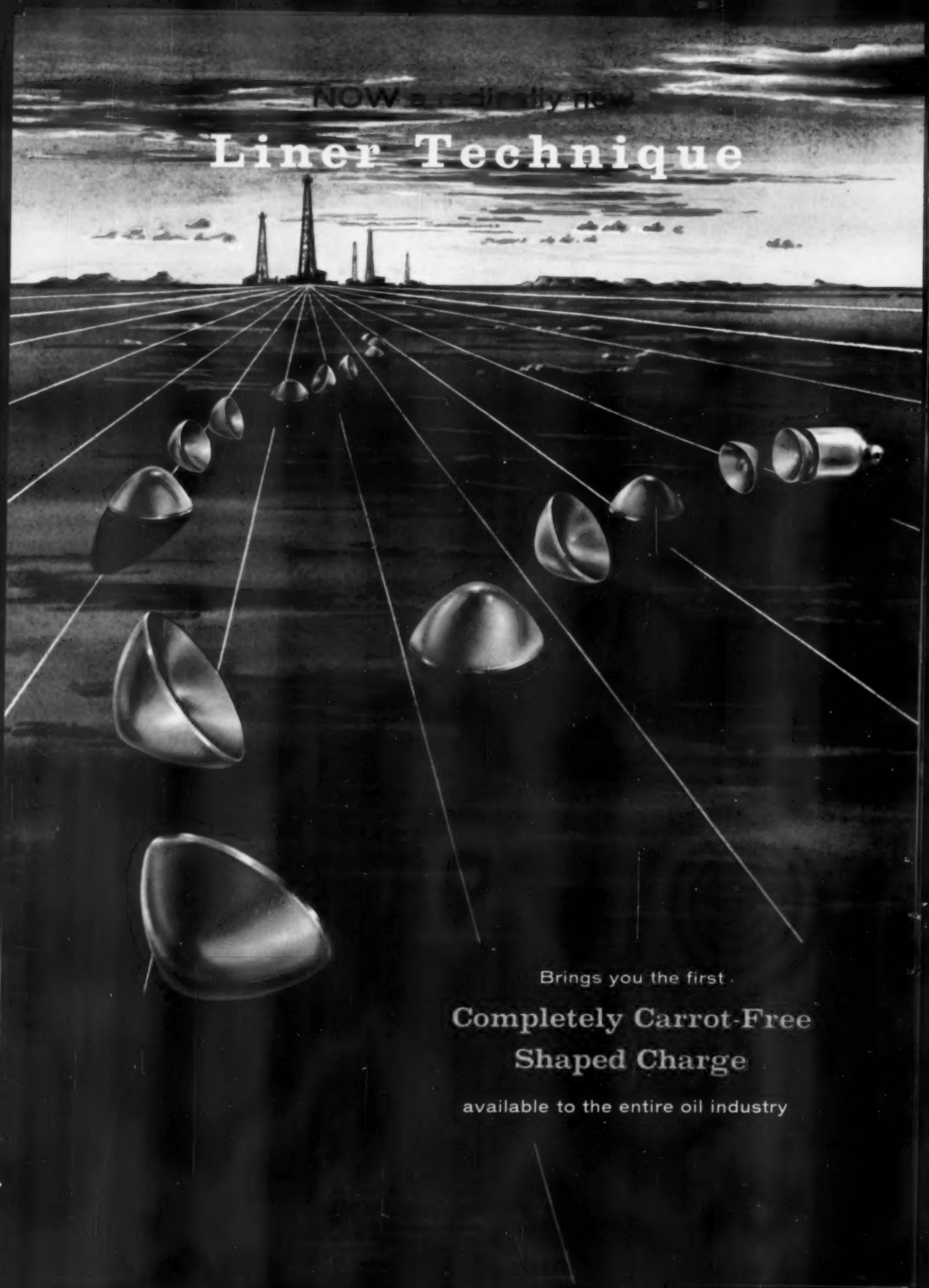
If conventional transportation is inadequate where you want to operate, Sikorsky helicopters may provide the answers to your problems. They offer a unique and thoroughly proved capability to go wherever you need to go, carrying worthwhile payloads. Write for complete information.

Photo: *The British Petroleum Co., Ltd.*

JUNGLE DUTY—In remote areas Sikorskys offer unmatched versatility in serving many vital operations. In New Guinea, for example, 3 S-58s speed the search for oil by transporting drilling rigs, workmen, and all equipment and supplies.

POURING CONCRETE—A Sikorsky S-58 prepares to pour a 2700-lb. load of ready-mixed concrete for tower footings for a high-voltage line in California. The S-58 saved time and costly road building by also flying steel towers into position at the inaccessible sites.

SIKORSKY AIRCRAFT
STRATFORD, CONNECTICUT
One of the Divisions of United Aircraft Corporation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Liner Technique
Brings you the first
Completely Carrot-Free
Shaped Charge
available to the entire oil industry

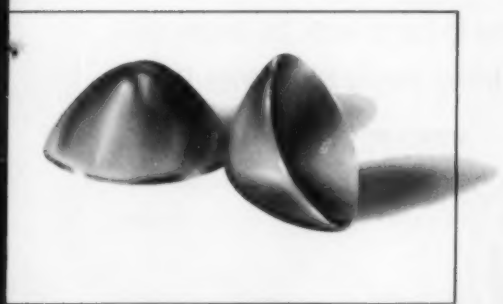
Another important shaped charge development by

Jet Research Center

A new, greatly advanced liner technique . . . developed and proven by Jet Research Center, Inc. . . . now offers the petroleum industry the *first completely carrot-free shaped charge!* It provides all the penetrating power of the jet, yet leaves no metal in the hole to impede production flow or plug drainage areas. This new liner technique will be available first in the new SUPER DYNA-JET®.

This new shaped charge development is another major advancement by JRC in its continuing program to provide better and more powerful perforating processes and equipment for the oil industry.

The benefits of this superior shaped charge will now be available through the world-wide licensees of Jet Process. Ask your service company for more information.



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GREATER PERFORATING POWER THROUGH RESEARCH

THERE IS NO BETTER TIME to take a close look at the wire rope you use. A look that assures you that for dollars spent you get **services rendered.** The rope you can look at with assurance is **Roebling Royal Blue Wire Rope.** It has been thoroughly tested in our laboratories and proved in the field. It will repay you in hard work for every dollar you spend. **You get your money's worth.** You get **Roebling Royal Blue Wire Rope.**

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DESIGN
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Its ready adaptability is evident wherever power is transmitted. It conforms to unique design requirements. Use wire rope to transmit power.

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"ROUGHNECKS" IN ACTION . . .

And this phrase describes the *equipment*, as well as the men who handle such back-breaking work! Bearings, for instance, have to operate efficiently under tremendous loads around the clock . . . day in, day out. Bower cylindrical roller bearings are engineered for jobs like this—incorporating such advanced design features as integral thrust shoulders and raceway, and improved internal construction. Painstaking quality control makes them last longer, require little or no maintenance. If you use bearings, either in original equipment or for replacement purposes, specify Bower!

BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 14, MICHIGAN

BOWER

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ROLLER BEARINGS

"Maintenance costs on our GMC's are lower than on any truck we've ever run!"

—says Neil Knight, Oklahoma City sandfrac hauler

MAKING THEIR OWN ROADS THROUGH MUCK AND MIRE, Knight's GMC's take a day-after-day beating. Hours are long—often ten hours a day. The job is hard – and fast-paced. Yet repair needs are few – breakdowns virtually nonexistent. "I've never used any trucks with such low running costs," says Knight.

◀ **JOCKEYING THESE GIANT RIGS**—even under the worst off-highway conditions – is no problem to this driver. Recirculating ball-bearing steering makes it easy—even at the end of a 10-hour day.

▼ **34-FOOT TANKS** ride easily behind these GMC's. Credit belongs to GMC *extra-stamina engineering* that makes light of the king-size loads and the tough operating conditions.

See Your Authorized GMC Dealer!

GMC TRUCK & COACH – *A General Motors Division*

GMC-America's Ablest Trucks

½ to 45 tons

Many of these huge tankers make trips of three to four-hundred miles per day over highways which subject them to almost continuous shock and vibration. **USS "T-1" Steel** is relied upon to provide brawn as well as bonus payload.

Simple arithmetic with USS "T-1" Steel:

3,470 lbs. deadweight saved = 815 gals. more payload per trip!

That's the story in a nutshell of this mammoth LPG transport, manufactured by Trinity Steel Company of Dallas, Texas. Its 9,000-gallon tank is fabricated entirely of USS "T-1" Steel, and weighs only 12,130 lbs.—a reduction of 3,470 lbs. Translated into gallons of propane, 3,470 lbs. saved equals 815 extra gallons of payload carried. Thus, a transport making 300 trips a year can haul 244,500 more gallons than a unit of conventional design.

Since a hauler nets about one dollar per year per pound of deadweight saved, and the life of the tanker will be about 10 or 12 years, a weight saving of 3,470 lbs. will amortize the cost difference of "T-1" Steel several times over.

Trinity Steel manufactures three sizes of "T-1" Steel tanks, each custom-made to fit the gross weight requirements of the state or states in which it will operate. The tank shown here is 7 feet by 34′4″. Working pressure is 250 psi, although tested out at 500 psi. Thickness of the "T-1" Steel shells is only .419″ and the heads .250″. All parts are made of USS "T-1" Steel, including the shells, heads, openings, fittings and all the structural padding. No other material is welded directly to the heads or shell of the tank.

Even larger "T-1" Steel tanks are being built—over 10,000 gallons—for use in states where gross weight laws permit.

The very high yield strength of USS "T-1" Steel, coupled with its exceptional toughness down to very low atmospheric temperatures, and its ready weldability (normally without preheating or stress relieving) make it ideal for pressure vessels, tanks, standpipes and penstocks. Welded ½-inch-thick test vessels of this remarkable steel have withstood working stresses of as much as 136,000 psi without bursting—even when chilled to 50° below zero. And where code provisions do not apply, large "T-1" Steel vessels in service today operate at working stresses of 36,000 and 40,000 psi!

USS "T-1" Steel is available for immediate delivery. It might very well be the answer to your pressure problem. For complete information, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and "T-1" are registered trademarks

United States Steel Corporation – Pittsburgh
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Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
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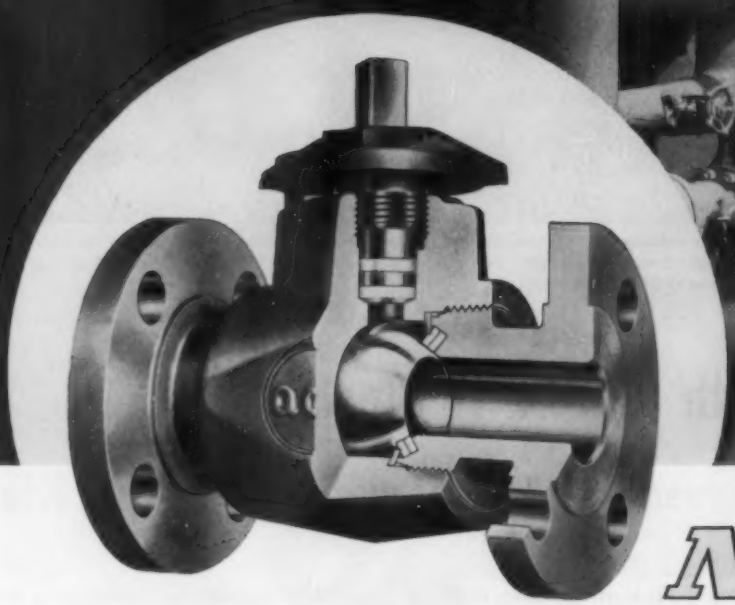
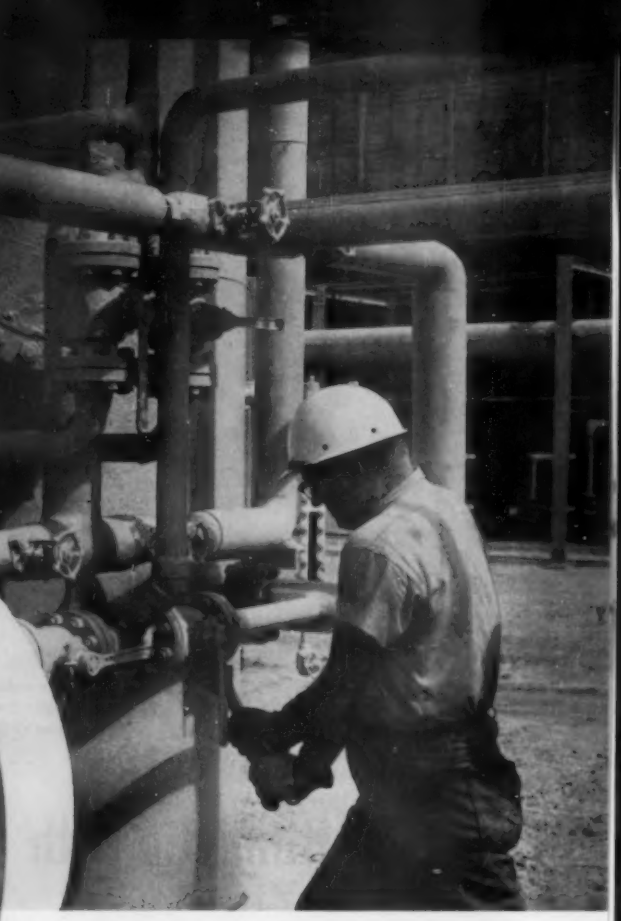
USS United States Steel

A new
service-proved product
of **W-K-M's**
Creative Engineering





NEW...

ACF non-lubricated Ball Valve

This newest of W-K-M's products is offered to valve users only after hundreds of tests in all types of service. This valve has proved that it will provide leakproof sealing in long, trouble-free service.

DESIGNED FOR SUPERIOR PERFORMANCE

Full Bore Conduit: Full, round conduit through body and ball assures full flow through valve. No restriction, no turbulence, no more friction or pressure loss through the valve than through an equivalent length of pipe.

Leakproof two-way seal: The ball is suspended between Teflon seats under compression, assuring leakproof service at rated working pressures or vacuum, indefinitely. Actual seating surfaces are sealed away and protected from any abrasive action of the lading flow in either open or closed position.

Other advantages: Minimum parts, minimum maintenance. Quarter-turn opening and closing. Corrosion resistant. Recommended for temperatures to 250° F.

Available in carbon steel (ASA 150 lb., 300 lb.), and semi-steel (200 lb., 400 lb.); sizes range from ½" through 6".

WRITE FOR CATALOG 1000

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5810

New acf Ball Valves tested up to 3½ years with these ladings without a single failure

Acetate
Crude ammonia liquor
Aviation fuel and Stoddard solvent
Propane
Toluol
Methylethylketone (MEK)
Alkaline slurry
Jet engine fuel (test cells)
Naphtha and coal tar solvents
Paint cleaner and thinner
Liquid soaps, DDT and chlordane
Vinyl chloride
Butadiene liquid
Copper ammonium acetate
Carbon bisulphide
Cleaning naphtha
Lime and soda ash slurry
Riboflavin media
Gasoline (tank truck)
Helium gas
Coke oven by-product gas
Gasoline (tank car)
Chlorinated solvents

W-K-M

They Say—

Lost in transit: 100 M.M.c.f.

Dear Sir:

In your article on page 82 of The Oil and Gas Journal of July 7, 1958, you conclude in your last paragraph, "CATC would have grossed nearly $1 million a month from the sale at the proposed initial throughput of the gathering system. . . ."

The total income from the sale of 75,000 M.c.f. of gas per day at 22.4 cents per M.c.f. computes to be $504,000 per month. Revenue from condensate sales of this gas can be estimated at $120,000 per month. Total: $625,000 per month. Please comment.

G. H. Schuster
U. S. Geological Survey
New Orleans

Editor's note: The item was transmitted by telegram and Western Union dropped a "1." The sale figure should have been 175,000,000 cu. ft., rather than 75,000,000. For further information, see July 28, p. 114.

Logs alone aren't enough

Dear Sir:

I have read your article ("Subsurface Map: Underground Guide for Oilmen," OGJ, July 7, 1958, p. 186) . . . and find it very interesting. In the main I agree with what you say regarding the subsurface map. However, I believe you are overlooking a very pertinent bit of potential data in your statement that "Logs of wells drilled in the area provide the bulk of the basic data required, etc."

It is desirable to have as many logs as possible, but that they provide the "bulk" of the data is a misconception. One log with seismic or other geophysical data can give a clearer picture of the subsurface in a new area than a dozen logs without benefit of geophysics.

For example, suppose you have two logs only on a north-south line and that log A, to the north, shows the producing horizon, or what is expected to be producing, to be higher than log B, to the south. Naturally, we assume south dip.

However, the seismic data between these points show north dip. Perhaps the data are insufficient to reveal the fault so we are left wondering as to how to effect a tie. In either case, are we to ignore the north dip? One must remember that an electric log represents a "point," while seismic data represent a "vector." One is in a single dimension, while the other is in two dimensions . . . The statement that electric logs are the "most useful" data on which to base a subsurface map needs qualifying in my opinion. It is very useful, without doubt, but its usefulness can be enhanced many times by coordinating it with geophysical data.

I believe that the combined interpretations are so far superior to either one singly that classifying one alone as the "most useful" is a gross error.

Richard H. Hopkins
Beaumont, Tex.

Editor's note: Louie Sebring of Champlin Oil & Refining Co., author of the article on subsurface maps, points out that as printed in The Oil and Gas Journal the article is a condensation of a paper appearing in the March, 1958, AAPG Bulletin. The original paper clarifies this point to some extent. Sebring says: "I quite agree that the combined interpretations are superior to either singly, but if the well data and the seismic data conflict in an area of adequate well control, I consider the well data as more reliable."

Sonic pump story accurate

Dear Sir:

This is to thank you for the accurate presentation of our sonic pump as reported in your July 7, 1958, issue, on page 66.

As a long time subscriber of The Oil and Gas Journal, we have developed the feeling that the Journal is accurate and factual. This feeling has been further confirmed by the presentation above-mentioned.

A. G. Bodine
President
Bodine Soundrive Co.
Los Angeles.

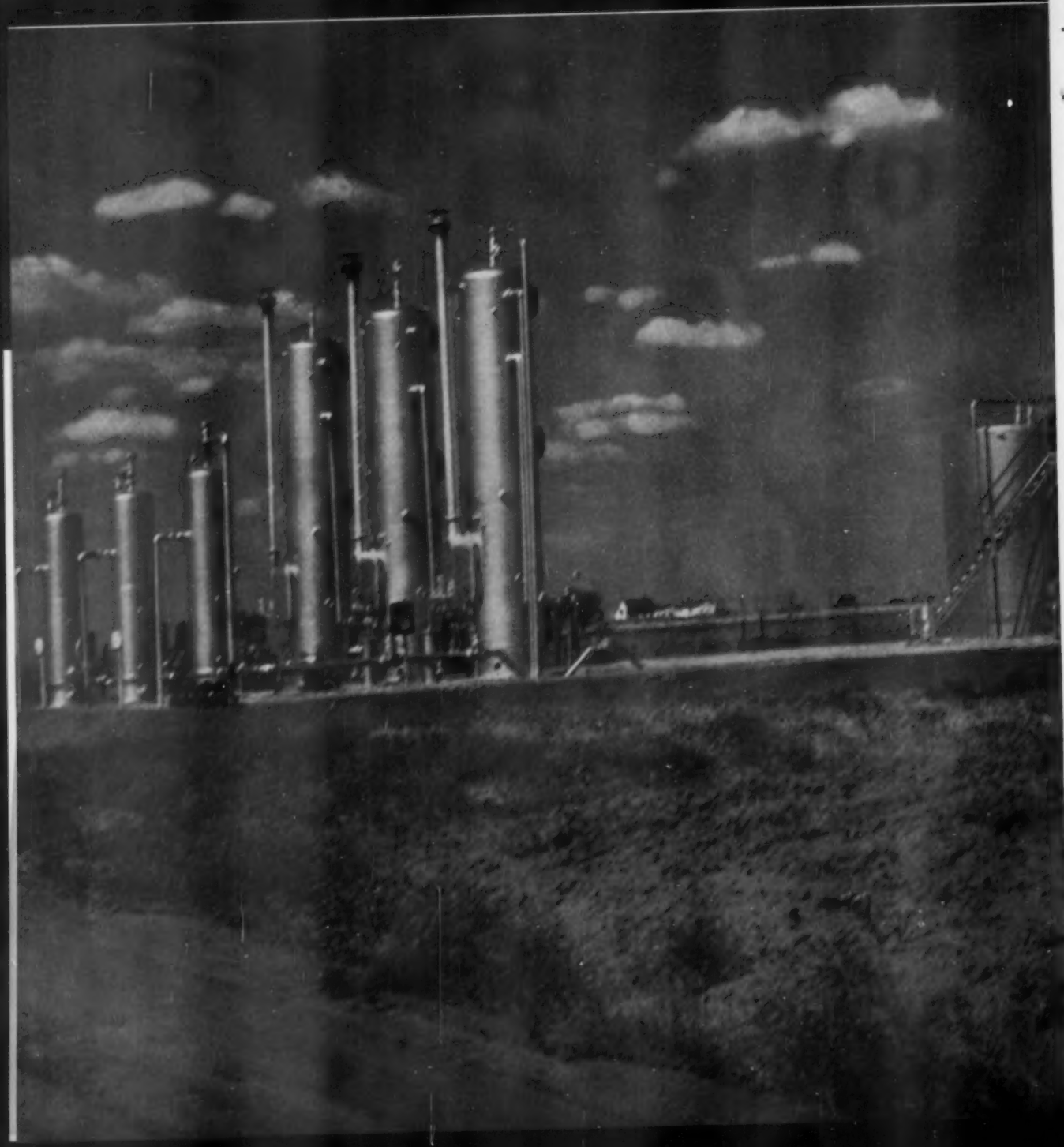
Effective reporting

Dear Sir:

I want to thank you personally and in behalf of the secondary recovery and pressure maintenance committee (of Interstate Oil Compact Commission) for the effective way in which you utilized information on the oil resources of the United States (OGJ, June 30, p. 46).

I think your condensation of our

Now...J&L adds



Continental Tanks!

Leasehold storage and processing equipment manufactured by **Continental Tank Company** of Oklahoma City, Oklahoma, is now available from **Jones & Laughlin Supply Division.**

Continental Tank offers a complete line of tanks and related equipment for the producer.

J&L can now provide customers with the **most complete production package** available to the oil and gas industry. For all requirements, from bottom hole pumps and sucker rods through tubing and casing to pumping units, tank batteries and lease processing equipment it's J&L all the way.

Distribution of **Continental Tank Company** products in the United States, Canada and overseas assures complete service to the oil and gas industry by the supply house that leads the field with quality.

Literature, information and prices are waiting for your call at any J&L store or office.

Buy from J&L and you buy the "best available."

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If it's sold by J&L....
It's the best available

O-C-T CASING HEADS ARE BUILT FOR EVERY COMPLETION CONDITION

and their economy is a guarantee . . . not a possibility

The "C-19," "C-19C," and "C-20" Casing Heads offer flexibility, because they meet every well completion condition . . . they offer economy because of safety and rig-time saving.

The "C-19" and "C-19C" offer economy because load capacity is twice as great as conventional slip hangers, because

- Openhole Hazards are eliminated
- Slips bite evenly
- Removal of blowout preventers before casing is suspended is eliminated

The "C-19" and "C-19C" save rig time because

- Installation is simple and thus rapid
- Sealing element, slip bowl, slips assembled as a single unit
- Seal is automatic
- No field welding is required

The "C-20" for medium depth wells is quick-setting, positive sealing. Same advantage of the heavier C-19 series is offered.

The Oil Center Tool Company stays abreast of oilfield problems.

Type C-19 Hanger in open position

Type C-20 Hanger in open position

where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

report was very fair, and that you wrote an interesting account of our findings.

As your editorial about the Compact (OGJ, June 30, p. 39) said so correctly, we should advance in the conservation of our country's oil resources and their proper utilization.

I have a belief that at the 1960 midyear meeting we can submit a more encouraging report. I think the next 2 years will see tremendous technological improvements in the recovery of oil.

Paul D. Torrey
Chairman, IOCC Secondary
Recovery Committee
Austin, Tex.

An old debate begins again

Dear Sir:

A few years ago I initiated a plea loud and clear for Arbuckle production in Grigston pool long since forgotten in the web of geological dogmatism. But, I am surprised that there is anyone today, particularly in Kansas, who disclaims its existence (OGJ, July 21, p. 35).

This is probably the best example to date of how too many geologists spend their time trying to debunk not only what they cannot see but also what they can see if they only look.

In reference to saving operators expense and grief in your columns. . . I would like to say that today, as always, there are and will be operators who will neither enjoy much or suffer much; for, in the finding of oil, as in everything else, the seas that run farthest from shore are only for ships that are stout.

A. R. Russell
Consulting Geologist
Salt Lake City

CALENDAR

AUGUST

11-14 Society of Automotive Engineers, National West Coast meeting, The Ambassador, Los Angeles.

18-19 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck, N. D.

18-20 American Institute of Chemical Engineers, American Society of Mechanical Engineers, second annual heat-transfer conference, Edgewater Beach Hotel, Chicago.

19-22 American Institute of Electrical Engineers, general meeting, Sacramento.

20-23 Alberta Society of Petroleum Geologists, eighth annual field conference, Nordegg, Alta.

25-27 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

SEPTEMBER

7-12 American Chemical Society, fall meeting, Chicago.

ANNOUNCING

For long uninterrupted runs in hard formations

V-DOOR DIAMOND DRILL BITS

PATENT APPLIED FOR

Another dividend you receive from Hycalog's continuing research program

Already Breaking Records for making hole in the deep Bromide sands of Oklahoma, the V-Door bit incorporates a new concept in bit design . . . *exclusive with* Hycalog.

To prevent plugging of the center section . . . *a common problem with conventional diamond bits* . . . the new Hycalog bit actually cuts a small core. Then, by a combination of hydraulics and bit design, the core is broken off in short segments and washed through the V-Door slot out of the hole. As a result of this design, far more hole per trip than ever before possible has been made in these extremely hard formations.

Ask your Hycalog *representative for performance records of* V-Door *bits.*

Hycalog, Inc.

565 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

"WE GET MORE MILES OUT OF OUR FORDS

... AND THEY COST US LESS, TOO!"

Says C. E. Cooper
Louisville District Manager
Williams Brothers Company

"Ford trucks are real workers

"We get more work out of Ford trucks than any other make—that's why we switched to Fords. We bought our first Ford trucks in 1951 and we're still using them! Their performance sold us on Fords for good and now we have 376 Ford trucks operating in the U. S. Our most recent additions were five '58 T-700's and T-800's, now working in South America.

"We run our Fords from 100 to 120 thousand miles, including about 25,000 miles off-highway, without an engine overhaul. Our T-800's gross up to 65,000 lb. and yet we still get about 6 miles per gallon loaded and 8 mpg empty.

"Ford outperforms all the trucks we've ever owned. And we like Ford's world-wide parts and service availability, too. But best of all, Ford trucks cost us less!"

Finance the easy one-stop way! Ask about the new

FORD FLEET TRUCK FINANCE PLAN!

Bring extra savings to your business . . . make your next truck a FORD!

Official registrations for 1957 show that *American business buys more Ford trucks than any other make.* There are many reasons for this . . . many reasons for *you* to make your next truck a Ford!

Ford trucks are your best buy! Ford's initial costs are *low* and resale value is traditionally high. The modern Ford Styleside pickups are the lowest-priced models available with full cab-wide body . . . giving you 23% more loadspace than any traditional pickup box.

Only Ford offers the economy of Short Stroke power in all engines, Six or V-8. And Ford's Heavy Duty V-8's offer new, advanced durability features. The modern Ford Six, available in Light and Medium Duty F- and P-Series trucks, has a new carburetor that gives you up to 10% greater gas mileage.

Ford's rugged cab and chassis construction means these new '58s are built to last. All this plus the proven fact that Ford trucks last longer adds up to America's No. 1 truck value.

See your local Ford Dealer for the latest in '58 trucks or the best in A-1 used trucks.

Williams Brothers winch-equipped Ford F-600's with headache rack and oil field bodies (above) are excellent for hauling and lifting bulky pipe-laying machinery.

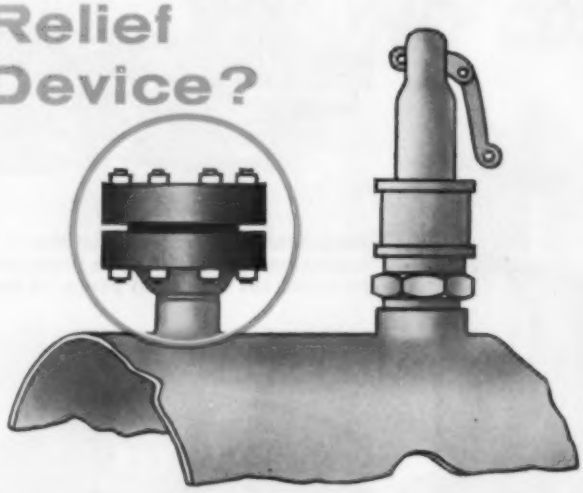
Ford's B-600's (above), equipped with 32-passenger bodies, serve Williams Brothers as rugged personnel carriers. They have the stamina to provide daily dependability.

Ford's F-600 with flat-bed body (being loaded with truck tires) is also used by Williams Brothers for general equipment hauling.

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

Why The "Standby" Relief Device?



The BS&B *Safety Head* Takes Over Under Abnormal Conditions

Your relief valve may need a helping hand.
The double protection provided by this relief valve–BS&B Safety Head combination is ideal when—

- **The nature of the pressurized fluid may cause malfunction of relief valve.**
- **Instantaneous over-pressure occurs due to abnormal heat or regulating conditions.**

When pressure-relief requirement is greater than the discharge capacity of the valve, the BS&B Safety Head provides an instantaneous, unrestricted opening.

Thousands of pressure systems are now protected with the added security of BS&B Safety Heads.

BS&B Engineers will be glad to evaluate your pressure system for application of the correct BS&B Safety Head.

Write, Wire or Phone...

BS&B — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Safety Head Division, Dept. 2-AB
7300 East 12th Street
Kansas City 26, Missouri
Telephone: BEnton 1-7200

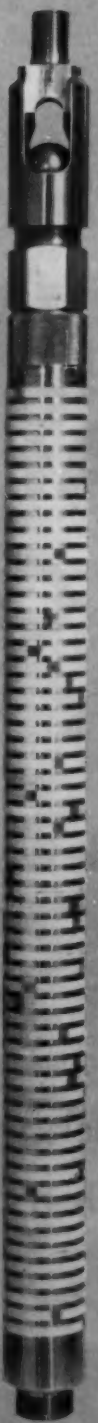
10-12 National Petroleum Association, fifty-sixth annual meeting. Traymore Hotel, Atlantic City, N. J.
10-13 Intermountain Association of Petroleum Geologists, ninth annual field conference, Paradox basin.
14-19 Instrument Society of America, thirteenth annual instrument-automation conference and exhibit, Convention Hall, Philadelphia.
15-16 Independent Natural Gas Association of America, annual membership meeting, Roosevelt Hotel, New Orleans.
15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.
15-17 American Institute of Electrical Engineers, fifth electrical conference of the petroleum industry, Baker Hotel, Dallas.
18 Natural Gasoline Association of America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.
18-20 Rocky Mountain Association of Geologists, field trip, Maroon basin, registration, Glenwood Springs, Colo.
21-24 American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.
24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.
25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.
25-27 Illinois State Geological Survey, biennial petroleum engineering conference, University of Illinois, Urbana.
29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.
1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.
3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.
5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.
5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.
7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.
9-10 California Natural Gasoline Association, thirty-third annual fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif.
10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.
12-18 OIL PROGRESS WEEK.
13-15 American Gas Association, annual convention, Atlantic City, N. J.
13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.
13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.
13-17 American Society of Civil Engineers,

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.

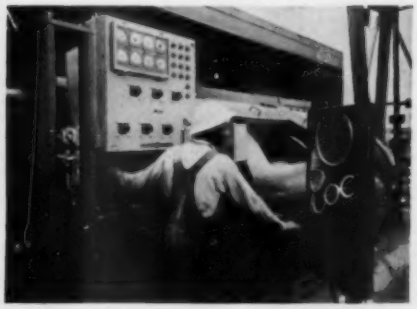
Drill More Hole At Less Cost!

For New or Repowered Rigs . . . General Electric Drive Systems Offer Savings That Other Electric or Mechanical Equipments Just Don't Duplicate

HERE'S HOW G-E ELECTRIC DRIVE REDUCES DRILLING COSTS ON NEW OR REPOWERED RIGS

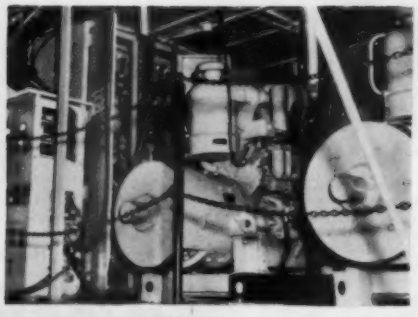
1. G-E DRILLING MOTORS HAVE BUILT-IN PROTECTION—REQUIRE LITTLE MAINTENANCE.

Because of drilling characteristics inherent in the G-E system, GE752H drilling motors need no special external control and will not run away in case of load loss. This helps to eliminate drill stem twist-offs and mud-pump overspeeding. Because of its sturdy construction, the GE752H motor requires little maintenance, gives added years of service.



2. G-E DRIVE GIVES YOU POSITIVE DRILLING CONTROL.

G-E Drive control is simple to operate and easy to understand. The driller's console may be floor-mounted or drawworks-mounted, to suit your requirements. Familiar, proven, air-operated devices give you positive control over all drilling functions, which enables you to drill more hole. And with G-E Drive, the main control compartment may be located away from the drilling area. It requires no attention during normal drilling operations.



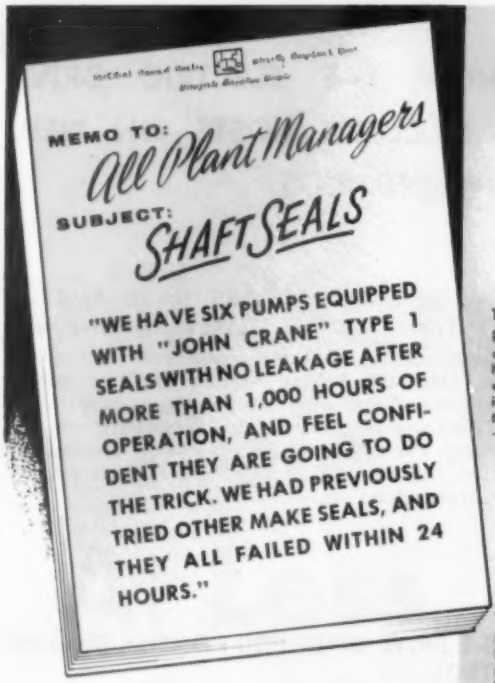
3. GENERATORS CAN BE USED WITH THE OIL-FIELD ENGINE YOU LIKE BEST.

When you use General Electric Drive, you can continue using the engine you know best because G-E generators are designed to operate with virtually all makes of oil-field engines. You need not spend money training personnel in the operation and maintenance of different engines. G-E generators will not overload engines and, outside of routine inspection, they require service only during major overhauls.

FOR MORE INFORMATION ABOUT GENERAL ELECTRIC DRIVE, call your nearest G-E Apparatus Sales Office. Drilling offices are located in Dallas, Denver, Houston, Los Angeles, New Orleans, and Tulsa; in Canada: Calgary and Toronto. For overseas requirements, International General Electric drilling offices are located in Bogota, Buenos Aires, Caracas, Maracaibo, Mexico City, New York, and Puerto LaCruz. General Electric Company, Locomotive and Car Equipment Dept., Erie, Pa. 115-28

Progress Is Our Most Important Product

GENERAL ELECTRIC


MEMO TO:
All Plant Managers
SUBJECT:
SHAFT SEALS
"WE HAVE SIX PUMPS EQUIPPED WITH "JOHN CRANE" TYPE 1 SEALS WITH NO LEAKAGE AFTER MORE THAN 1,000 HOURS OF OPERATION, AND FEEL CONFIDENT THEY ARE GOING TO DO THE TRICK. WE HAD PREVIOUSLY TRIED OTHER MAKE SEALS, AND THEY ALL FAILED WITHIN 24 HOURS."

This is part of an actual memo sent by one plant manager to others of the same company in different sections of the country—and that company is now exclusively specifying these and other type "John Crane" Shaft Seals for *all* their liquid handling requirements.

You too can save time, trouble and expense by doing likewise.

You'll find a "John Crane" Shaft Seal for every service . . . from hot or cold water to the most destructive acids and corrosives . . . high temperatures, high pressures . . . in types and sizes to meet practically any mechanical or dimensional requirement.

Send us details on your application. We'll recommend the proper shaft seal. Request Bulletin S-204-3 for complete overall information.

Crane Packing Co., 6419 Oakton St., Morton Grove, Illinois, (Chicago Suburb).

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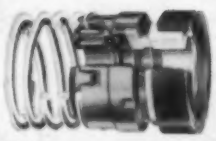
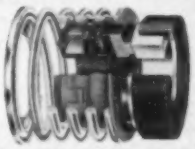


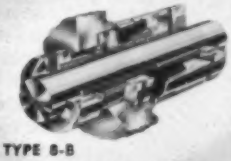
TYPE 1

Designed for limited stuffing box diameter. Handles water, light hydrocarbons, refrigerants, mild acids and other liquids non-injurious to synthetic rubber at temperatures from −40°F. to +212°F., pressures to 200 psi.



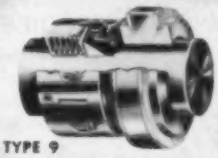
TYPE 2

Designed for limited stuffing box length. Handles same services, temperatures and pressures as Type 1.



TYPE 8-B

Heavy duty, high pressures. Packaged construction for easy installation. Handles pressures to 1200 psi., temperatures from −40°F. to +250°F. Services same as Type 1.



TYPE 9

Famous as a problem solver. Sealing members of chemically inert Du Pont Teflon. Engineered to service conditions to handle practically all destructive acids, corrosives and gases at temperatures from −120°F. to +500°F., pressures to 150 psi. Available in balanced construction for pressures to 750 psi.

annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

16-18 Permian Basin Oil Show, Odessa.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-24 Southwestern Federation of Geological Societies, technical meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

30-Dec. 5 American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Kansas City.

7-10 American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.

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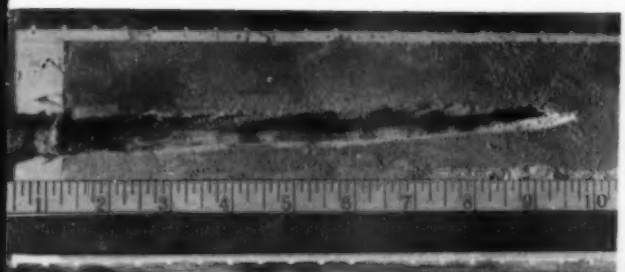

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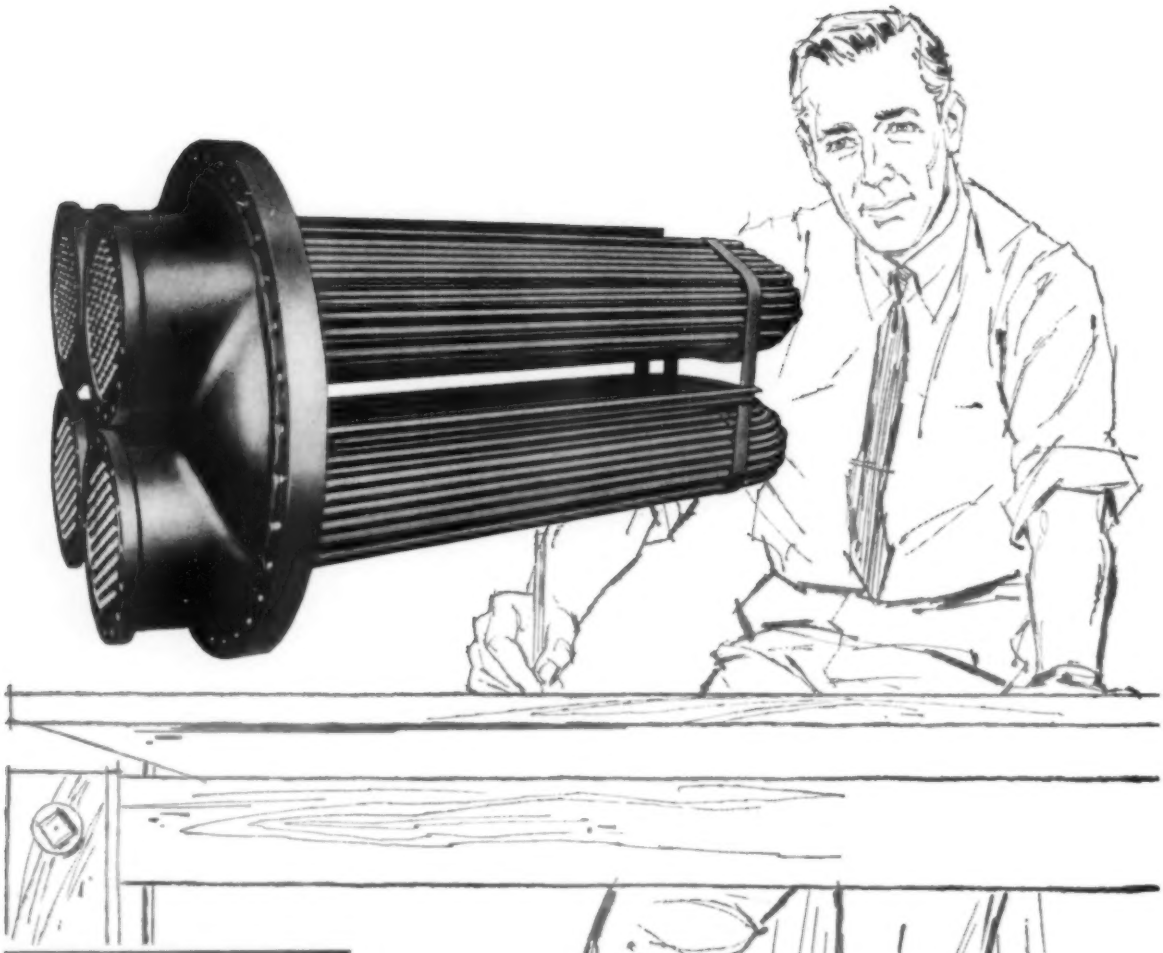

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TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00. Note: Payments from outside the U.S.A. may be made by international money order, New York exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1958 by The Petroleum Publishing Co.

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JOURNALLY SPEAKING

Rhigolene and Cymogene

EVER HEAR of rhigolene and cymogene? How about you petroleum chemists and refining engineers? We asked a couple of such and drew nothing but blanks. Yet they used to be some of the chief products of petroleum refining.

We acquired that intelligence while doing a little digging into the 100-years' history of the oil industry, which is going to be celebrated in a big way in 1959. The dope was in a couple of old magazine articles, printed in the 1880's when the industry had barely reached its majority.

"No fewer than 10 substances are obtained from petroleum by the refining process besides the beautiful aniline dyes, which are extracted from the residuum by chemical processes," it is related by a feature writer in the Century Illustrated Monthly of July 1883.

"These substances, named in the order of their specific gravity, which varies from 625 to 848, are as follows: 1st, rhigolene, the most volatile product of the first distillation used to produce local anaesthesia; 2nd, gasoline, used in artificial-gas machines; third, fourth, and fifth, three grades of naphtha, used for mixing paints and varnishes and dissolving resin; 6th, kerosene, the common illuminating oil of commerce; 7th, mineral sperm oil, a heavier oil for burning in lamps, which does not take fire under a temperature of 300°, and is employed on steamers and railroads; 8th, a lubricating oil for machinery; 9th, paraffin, from which candles are made; and 10th, paraffin wax.

"Then there is the residuum, usually called coal tar, which has a variety of uses. In most refineries the products are only naphtha, kerosene, and residuum."

A little more detail was given by an article in Harper's Magazine of January 1886. After describing a typical refinery of the day, it said:

"All distillate is sent to the receiving room where a separation is made according to its density. All that is below 60° B. (Baumé standard of density) and down to 40° B. is turned into a tank for kerosene distillates. The lighter portions, or the earlier runs from the still, go into naphtha, gasoline, or benzine tanks, while the heavier oils, below 38° B., go into the manufacture of paraffin and lubricating oil.

"The lightest vapor is called rhigolene, ranging from 115° to 105° B., though it and the second run are usually turned into the naphtha tanks. When saved it is used as an anaesthetic. The next product is known as cymogene, ranging from 105° to 95° B., and is sometimes used in ice machines.

"Below this is gasoline, 95° to 80° B., used largely in country houses for manufacturing gas. The Park Avenue Hotel, New York, the Grand Union, Saratoga, and the Hotel Kaaterskill are lighted by this kind of gas.

"Next comes naphtha, 80° to 65° B., which is extensively used in South American towns for streetlamp lighting, and in conjunction with benzine, 65° to 60° B., as a substitute for turpentine in making varnishes and paints. They are also used as a solvent to remove stains and grease and for cleaning wools, and for this purpose are of superior value."

So, you see, in those days rhigolene and cymogene ranked right up with—or right down with—gasoline in importance. If the automobile hadn't come along to make gasoline overshadow the others, rhigolene and cymogene might be major products of the petroleum trade today.

We gather from these articles that product specification was something less than an exact science in 1880's. This is borne out by a helpful hint included by one of the writers:

"The quality of refined petroleum depends on the care and honesty exercised in the distilling process. Good oil is not dangerous, as many people suppose all kerosene must be. Only the poorer grades are liable to take fire.

"A very simple test can be applied by any housekeeper to ascertain whether the fluid is safe or not. Partly fill a cup with water warmed to 120° F.; turn in a little oil, stir the mixture, and apply a lighted match to the surface. If it takes fire, the oil is unfit for use; if not, it is entirely safe."

—Henry D. Ralph

DOWELL OFFERS FOUR COMBINATION ACID/FRACTURING SERVICES—HERE'S WHY

There are many cases where formations do not respond well to either acidizing or fracturing treatments alone. Frequently, however, these same formations show high production increases and flatter decline curves when given a treatment combining chemical acidizing and mechanical fracturing. Dowell has developed and field-proved four such acid/fracturing services. If you have had poor production results with either acidizing or fracturing alone, one of the Dowell acid/fracturing services, described here, may be the answer to your specific well problem.

ACID PETROFRAC*—Developed primarily for use in limestone and dolomitic formations, Acid Petrofrac employs an acid-in-oil emulsion. The fluid may be mixed to almost any desired thickness, and the acid concentration can be varied from one to fifteen per cent. The emulsion used in this service has low friction loss and excellent sand-carrying properties. Its retarded acid properties allow deep penetration before spending, and its silicate control properties are designed to provide clean flow channels for better, longer-life wells.

DUOFRAC*—This new Dowell service was developed especially for use in limestone and dolomite formations containing salt. Duofrac uses fresh water, light acid concentrations, and sand. The water in Duofrac acts to dissolve the salt present, while the dilute acid attacks the limestone or dolomite. The amount of acid used in each treatment depends on the characteristics of the producing formation. Treatments are usually made with large volumes and at high-injection-rates.

FRAC ACID*—Developed for use in formations of relatively high solubility, Frac Acid employs thickened, inhibited hydrochloric acid carrying suspended sand. After a controlled length of time, the thickened fracturing fluid reverts to water thinness. The sand is retained in the formation. Frac Acid contains more acid by volume than any other acid/fracturing service offered by Dowell.

STRATAFRAC*—Stratafrac uses an acid-kerosene emulsion with sufficient body to carry sand in suspension. The materials used in this service may include agents to reduce silicate swelling, and to dissolve clay and silicate particles in the formation. The acid concentration and the size and amount of sand used in Stratafrac can be tailored to fit formation conditions.

For more information on Dowell's acid/fracturing services, contact your local Dowell engineer. He will help you select the service best suited to the conditions of your well. Call any of the 165 Dowell service points. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

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BARBER COUNTY, KANSAS:
Although only slightly soluble in acid, the Mississippian chat formation responds well to Acid Petrofrac. Typical treatment: 1000 gallons fluid and 1000 pounds sand per foot of perforation, injected at 30 bpm. Results on gas wells are often ten times drill stem test.

YOUNG COUNTY, NORTH TEXAS:
Frac Acid usually obtains good results in the Caddo lime formation. Treatment example: 10,000 gallons 10 per cent thickened acid and 10,000 pounds sand, preceded by 500-gallon spearhead of Mud Acid. Treating material injected down casing at average rate of 33 bpm at 2200 psi maximum.

LINCOLN PARISH, NORTH LOUISIANA:
Stratafrac is often used in the Hosston formation with excellent results. It is designed to clean up fast and to suspend sand well at high temperatures. Recent treatment example: A new well was treated with 8500 gallons acid-kerosene emulsion, 2000 gallons low-surface-tension acid and 12,000 pounds sand. Pressures ranged from 4000 psi minimum to 6200 psi maximum. After treatment, initial open flow was 4100 mcfpd.

ECTOR COUNTY, WEST TEXAS:
In the Goldsmith Clearfork formation of the Permian Basin, Duofrac is frequently the answer to difficult production problems. A recent example: Before treatment the well would not produce. Dowell used a four-stage treatment — (1) 500 gallon spearhead of Mud Acid, (2) 10,000 gallons fresh water with de-emulsifying agent, (3) 25,000 gallons 7½ per cent acid with de-emulsifying agent and 25,000 pounds sand, and (4) 10,000 gallons fresh water with de-emulsifying agent as a flush. Potential after 35 days was 360 bopd. After 95 days, 273 bopd.

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The way forward now is sideways

ECONOMISTS who view business conditions as lines on graphs like to talk about a "sideways movement" in an industry. By this they mean that a trend line is extending horizontally, without decided swings either up or down.

This fairly well describes the current condition of the petroleum industry as a whole. Many of the factors that would make up an over-all activity index for oil have turned up in recent weeks, but they are still poorer than they were a year or so ago.

This means that the industry's collective management should be pretty cautious about reading too much immediate optimism into the improved conditions of the moment. It should plan on progressing sideways for some months yet.

THE BOTTOM OF THIS RECESSION has been reached. There seems little doubt about that. And things are going to look a lot better this fall than they did last spring.

But it doesn't necessarily follow that the only way to go is up. The general average of activity could mosey along without much change in direction for awhile. Or some features of the industry could take another nose dive.

The thing to watch out for is that no dip back down is caused by indiscretions within the industry itself. This could easily come about by letting some things get far out of balance while the industry as a whole is walking a tightrope toward recovery.

Demand for oil has improved—a little—and should improve more this winter. But still the year's total probably won't be higher than last year's. That's a sideways movement, and it doesn't call for big increases in production and inventories.

Crude stocks have been worked down close to a minimum, but it wouldn't take much of an increase to trigger excessive refinery runs. And stocks of refined products are still a bit high even for the currently better rate of consumption. The wise course is to keep stocks in a middle position, with slack to permit adjustment in either direction.

Prices are firming up, giving the industry a promise of restoring its earnings position. But the market is so delicately poised that a small oversupply could grease the skids for a slide.

THE JOB TODAY is to hold the gain the industry has made, that is, the halt to the downward movement. For the next several months it should be considered enough progress just to move sideways.

Sure, the worst is over. But eagerness to rush ahead fast should be held in check until it is more certain that all the wrinkles in the trend lines have shifted from sideways to upwards.

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Alkylate Scarcity Squeezes Refiners

• Military demand has sopped up available alkylate, leaving refiners hard put to meet demands for improved gasoline quality. This new problem points up another: Research ratings alone no lon ger reflect fuel performance.

THE NATION'S REFINERS have been caught in an unexpected, but temporary, tight spot.

Fuel demands generated by the Middle East crisis are affecting the industry drive to improve quality of premium gasolines.

Immediate trouble stems from the sudden tightening up of the alkylate market.

This refinery product is a vital component of aviation gas. Recently it has been looming large in refiners' plans to decrease the sensitivity of their premium gasolines to solve baffling problems arising in today's high-compression auto engines.

So when American Marines moved into Lebanon, military demand for avgas and alkylate suddenly soared. This new demand was imposed on an already rising need for alkylate to use in motor fuels. As a result most refiners immediately became concerned about their alkylate position.

The alky situation . . . Speaking generally, refiners say all the slack has been taken out of the alkylate market.

Several major refiners have committed their supplies. Others are studying their own internal needs before releasing any for the market.

One big eastern supplier says the Government's July 24 bid for 2,024,000 bbl. of 115/145 avgas for delivery by the end of the year has sopped up all available alkylate.

The Government got the commitments at about 17 cents a gallon based on the gulf. But it still is negotiating for whatever companies have over and above that. Price on these liftings is expected to go a bit higher.

This refining official predicts the additional military buying makes the alkylate picture look tight for some months.

Another eastern refiner says his company is committed for all aviation alkylate for 6 months. It has none available and was unable to bid on the Government's July 24 request.

A third major refiner, one of the big suppliers of avgas, is all sold out. Its excess was picked up by the Government, and the company now is in a short supply position. This company also uses a moderate amount of alkylate in both its regular and premium gasolines to aid sensitivity.

Military stockpiling? . . Still another eastern-based major takes a broader view of the alkylate situation.

Its refinery executive says the present tight supply is not serious. The Government asked for a large quantity of avgas for virtually immediate delivery. Supply in that volume just didn't exist, and the industry was unable to turn it out on a moment's notice.

This official believes the industry can supply the avgas in time, and the military will not suffer. The military, he thinks, is using the purchases to build inventories to a comfortable level—not for immediate requirements.

Most refiners believe the military had permitted its avgas stocks to drop and became concerned when the Lebanon affair imposed an unusual demand.

Similar reports on a tighter alkylate market come from the Mid-Continent and Gulf Coast refining areas. Some refiners have had requests to move all the alkylate they could spare to the gulf, even if it meant using tank cars.

Only one major company, which is in a good position with a broad refining and marketing base in this country, reported no alkylate shortage. This firm reportedly is stepping up use of alkylate in avgas and backing off on use of lead to sop up its excess.

The pinch . . . Most refiners agree the generally tight alkylate situation now may cause the drive to upgrade motor fuel to suffer a bit.

They believe, however, if no shooting war occurs and when military stocks are built up, the problem will ease off.

Then refiners can resume their plans to use alkylate in motor fuels. On the long term—the next 2 or 3 years—the prospects are that there will be plenty of alkylate available for this use. Military demand for avgas is expected to ease off because of increasing use of jets. This lowered demand plus current construction of alkylation facilities actually could mean a depressed alkylate picture.

Sensitivity . . . This rising use of alkylate in motor fuel was really beginning to pick up steam when the Middle East suddenly complicated refiners' plans.

The trend had been developing for several months in most sections of the country. But two pipeline developments brought the situation into the open:

. . . **Oklahoma Mississippi River** Products Pipe Line Co. on July 1 established a 10-point octane spread on one premium grade shipped on its line. The specification sets a 99-octane research test with a minimum 89-octane motor test for the premium gasoline. The spread between these two octane-testing methods is known as sensitivity.

. . . **Great Lakes Pipeline Co.** announced that effective September 15 it will accept only a premium gasoline of 99-octane research and 89-octane motor for tender to all 15 of its terminals.

Oklahoma Mississippi still will accept a 97-octane premium but Great Lakes plans to discontinue accepting tenders of its old 98-octane grade

Why Alkylate is the Key to Current Gasoline Blending

	Research octane (RON)	Motor octane (MON)	Sensitivity (RON minus MON)	Road octane (Uniontown)
Alkylate	103.0	104.5	— 1.5	107.5
Reformate extract	103.7	94.0	9.7	103.5
C_7 plus reformate	103.0	93.5	9.5	102.5
C_5 plus reformate	100.0	91.7	8.3	100.0
Catalytic cracked	99.0	87.5	11.5	98.0

OF THE FIVE typical high-quality blends which go into premium gasoline, alkylate is by far the best performer.

The reason is quite apparent in the table: Alkylate, though it can't claim the top research octane rating, does much better by the motor-octane method and, most important, excels in actual road performance.

The current controversy over methods of measuring octane ratings arises from the fact that, as the new cars become more demanding, the research octane rating becomes less indicative of actual fuel performance.

The old motor method, on the other hand, more closely matches actual driving performance, or road ratings.

In the past, top billing has gone to the research rating of gasoline. Even today, as it approaches or passes the magic 100 mark, research is getting a big play in advertising.

But the payoff is road performance. As requirements rise, today's cars are beginning to rate fuels more nearly as they are evaluated in the laboratory by the motor method. Both yardsticks are still important, but their relation to each other, called sensitivity, is something the industry is watching more closely.

Shown here are the antiknock values of five typical high-quality leaded blends. Note the more direct correlation of road with motor octane.

Note, too, that neither the research nor the motor method gives the refiner a direct fix on his ultimate goal—how the fuel is actually judged by the car on the road. The industry is dissatisfied with both laboratory methods on this count. But it must live with them until something better is developed.

Of all available stocks today, alkylate is the standout. Moreover, alkylate shows better road performance when blended with aromatics than with cat gasoline. Polymer gasoline ranks generally higher than cat cracked by the research method. But both motor and road tests downgrade this olefin to the point where it is now going out of the picture as a premium blending stock.

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premium which had no motor-test requirements.

The competitive picture is this:

The Oklahoma Mississippi line moves products of Oklahoma refiners to a Memphis terminal. There it supplies marketers in the Mid-South area and tenders gasoline to Texas Eastern Transmission Corp.'s Little Inch products line. That means Oklahoma Mississippi-moved products compete with refinery products from both the Gulf Coast and the Chicago area.

Great Lakes Pipeline serves Oklahoma and Kansas refiners by moving their products into the Upper Middle-West markets, where they compete with Chicago-area refiners.

Competitors of refiners which use these lines in some instances had improved quality of their gasolines, and the Mid-Continent refiners wanted to protect their position in the quality race with the less sensitive 99-octane research and 89-octane motor blend.

Both companies said the switch to the higher blend was prompted by volume demand of its shippers to meet competition, but the underlying cause is more critical.

What it means . . . Most refiners moving premium gasoline through Great Lakes will have no trouble meeting the 99-octane research.

The problem will be the 89 motor rating. This could be handled, at a price, by slugging more alkylate into the blend. But the sudden tightening of alkylate will prove rough on some refiners who don't have their own production.

A 10-point sensitivity fuel at this level can require up to 15-20% alkylate. Reformate is absolutely necessary, and practically all refiners in the Oklahoma-Kansas area are in good position on this process. The new level means backing out further on cat cracked stocks and on polymer gasoline.

The action of Great Lakes, taken at the request of its shippers, may be taken as a straw in the wind. In fact, Great Lakes circulated a letter recently asking for views on the possibility of going to a 9-point sensitivity premium, rating 99 research and 90 motor. It was asked to do so by one of its shippers. This grade could conceivably comprise 25-30% alkylate. But the about-face in alkylate makes any acceptance of this proposal very remote at this time.

Competition has served only to spark these upward moves in motor octane. The underlying cause is a firm requirement by today's cars on the highways. Some 1958 models are running into trouble with blends exceeding 100 research octane, but with motor falling below 90. On the other hand, some blends rating 99 research, but with lower sensitivity, are filling the bill.

The situation defies generalization. But it is conceded in many cases that top car requirements can be met as readily by boosting the motor rating of premium grade fuel, as by adding to research octane quality. Refiners are now investigating the economics of such moves.

How about next year? . . . Sensitivity is going to gain in importance next year. While no assault on top compression ratios is expected in the 1959 models, a gradual increase up to the top 10½:1 level is expected. The over-all average ratio may rise one-half unit.

This will raise octane requirements, but it is not the only factor to do so next year. Around Detroit, the emphasis is swinging to economy, with less drum-beating on horsepower and performance.

This will mean two trends; toward higher temperature operation and leaner fuel-air mixtures. Both of these have the effect of raising octane requirements (both research and motor) of engines with the same compression ratios.

NPC Future in Doubt

. . . as Seaton asks tight government control over entire scope of operation. Oil men are now studying proposal.

A MAJOR CHANGE is in the offing for the National Petroleum Council—if it continues operating at all.

Secretary of the Interior Fred A. Seaton last week made public a copy of a letter to chairman Walter S. Hallanan asking drastic changes in its rules of operation.

In essence, Seaton called for a government official to serve as cochairman of the council and of its committees and of some subcommittees.

Seaton also proposed that the government cochairman call all meetings of the council and of its committees and formulate the agenda for each of those meetings.

Members of the committees and subcommittees also would be subject to the approval of the government cochairman.

These are major changes, as the council has been under the sole chairmanship of Walter S. Hallanan of Plymouth Oil Co. since it was formed at the close of World War II as the top industry advisory group for oil and gas to the Secretary of the Interior.

Government officials have suggested matters to go on the agenda for meetings, but the council has had the right to refuse to place them on the agenda when it thought them beyond the scope of the council's work.

No comment . . . Hallanan confirmed receipt of the letter from Seaton and said it is being studied by two members of the NPC, Hines Baker of Standard Oil Co. (N. J.), New York, and J. Howard Marshall of Signal Oil & Gas Co., Los Angeles.

Hallanan pointed out that he, Baker and Marshall had met with Seaton and Atty. Gen. William P. Rogers a few months ago about rules of operation of the council. Beyond that, Hallanan declined to comment.

First reaction of some persons close to the council, however, was that the changes proposed by Seaton are impossible and unworkable. Others saw a chance that an agreement could be reached to continue the council's work.

The council, which has held meetings each 3 months since it was formed, last met in October 1957. In December, Secretary Seaton wrote Chairman Hallanan insisting that the council change its rules to abide by Justice Department criteria.

Following the letter, there were several meetings of a delegation of NPC officials with Seaton and DJ officials. The NPC officials argued that the council can best serve the Government if it has its own chairman and relative "independence."

Seaton's proposal . . . Seaton's letter repeated that the council "is a splendid example of worth-while cooperation between Government and industry, and that it is a valuable source of information and advice."

Seaton said "it is my desire" that there be "further amendment" by the council of its organization to include these points:

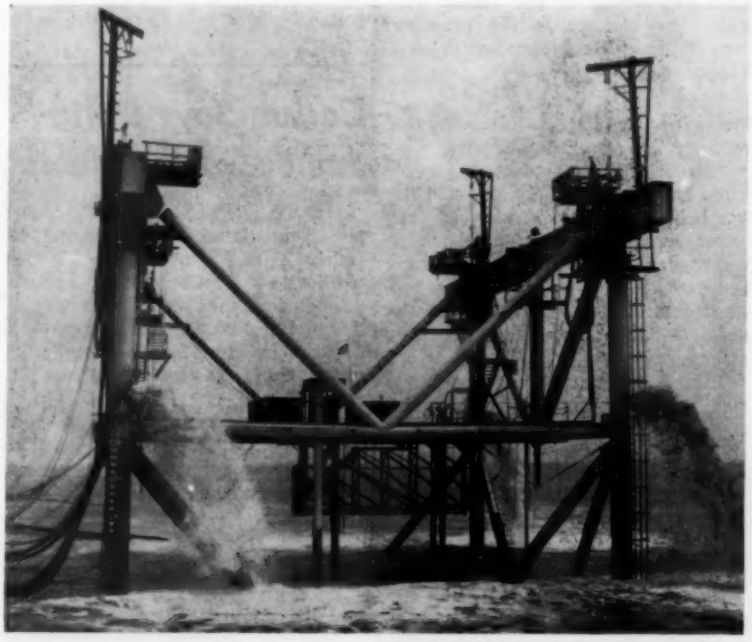
1. The Secretary of the Interior or a full-time official of the department named by the secretary shall be cochairman of the council with "equal rights and authority to that of the nongovernment chairman" and with "authority to call the meeting to a close if he feels it is being improperly used."

2. The cochairman or a full-time employe of the department shall be cochairman of "all meetings of the committees of the council" and, as deemed feasible by the secretary, "of all meetings of the subcommittees of the council."

3. Members of committees and subcommittees "shall be subject to approval by the cochairman of the council."

4. Comprehensive minutes of meetings of the council and its committees and subcommittees shall be kept and the cochairman shall certify that they are accurate.

5. Meetings of the council, and its committees and subcommittees for which there is a cochairman, "shall be at the call of the cochairman and the agenda for such meetings shall be formulated by the Government."



California Permanent Platform Landed

STANDARD OIL CO. of California this week is installing a prefab superstructure and drilling decks 50 ft. above water on California's first permanent offshore drilling platform.

Jetting-in of the platform (photo) was completed in 100 ft. of water on a site about 2 miles offshore from Summerland, Calif.

Each of the four caissons, 40 ft. high and 27 ft. in diameter, which support the legs had to be sunk about 23 ft. into the ocean floor. High-pressure water was used for excavating. The cuttings then were lifted to the surface by compressed air.

Installation of the superstructure and drilling decks is expected to be completed late this month, and the first well will be spudded immediately. The platform ultimately may hold 25 producers.

Import Victory Claimed

. . . by Government aide as voluntary control program ends first year. Big problem ahead: How to treat newcomers.

THE VOLUNTARY imports-control program is 1 year old.

And it is working remarkably well, according to Assistant Commerce Secretary Frederick H. Mueller.

He's the man assigned the oil imports job by Commerce Secretary Sinclair F. Weeks, chairman of the cabinet committee on oil imports.

Mueller expressed his views in an interview on the achievements made since President Eisenhower on July 29, 1957, flashed the go-ahead on a voluntary program of quotas for oil men importing crude.

Mueller said he feels that the U. S. industry is entering a period of better health, that natural gas is a major reason oil producers face trouble, that the voluntary import program should remain voluntary, and that the foreign trade bill passed by the Senate will mean few changes in the program even if adopted by House-Senate conferees.

Praise for program . . . In lauding the voluntary program, Mueller said:

"We held imports of crude petroleum down considerably below what was being imported and a great deal below what was programed to be imported. I, personally, am very happy that the voluntary program has worked as well as it has. It has practically 100% acceptance on the part of importers."

Taking a slap at those proposing mandatory controls, he said: "One of the things we should feel comfortable about is that we have a voluntary program that can be changed overnight, instead of a mandatory, legislative program. This is particularly good in this time of unrest in the Middle East."

Growth problem . . . A major problem facing the voluntary program lies in requests of 54 newcomers to start importing 363,284 bbl. daily of crude oil into Districts 1-4 and of 12 present importers to increase their imports by a total of 191,000 bbl. daily.

This adds up to 554,284 bbl. daily. However, the office of Capt. M. V. Carson, Jr., oil imports administrator, said that 11 of the 54 are not eligible to import. Their requests of 120,000 bbl. daily should be deducted from the totals sought.

Mueller commented, "There is a distinct problem there that is going to have to be met in some manner. A few years ago there were only 10 importers. Now there are far more.

"My personal belief is that some weight should be given to the people who invested in foreign oil. What will be the outcome and what determinations will be made will have to await the hearings and any conclusions growing out of them."

Products decision . . . Captain Carson, meanwhile, plans to stand pat on his request that imports of unfinished oils be held to the levels of May and June.

Spokesmen for independent producers claim the choice of this base period allows far too much of the unfinished oils to come into this country.

Carson explained that the cabinet committee on June 4 asked that imports of oils be held to the "currently prevailing level." He said he took May and June as the base because "that looked as reasonable as anything else."

Russell B. Brown, counsel of the Independent Petroleum Association of America, and John Davenport of the Texas Independent Producers and Royalty Owners Association, complained against use of June as part of the base in separate face to face meetings with Carson.

"The month of June is the highest month on record for imports of unfinished oils," Brown said in a report letter to members. "During June, these imports averaged 145,000 bbl. per day."

May imports were 46,000 bbl. daily, so use of the 2 months, sets 90,000 bbl. daily as the base. This compares with 15,000 bbl. daily in the first 3 months of this year. If the cabinet committee instructions were followed, May levels would be the base, Brown added.

The Carson action on unfinished oils, he added, permits imports in excess of levels scheduled through November, and can "hardly be considered a limiting action."

Tough language . . . On the trade-bill question, Sen. Robert S. Kerr of Oklahoma sees a good chance of keeping the tougher Senate language in the final version.

The bill authorizes and spells out the rules for the Government's voluntary program to limit oil imports.

Kerr, one of the Senate conferees, said the Senate language "will do the trick" of curbing imports of crude oil and oil products further "if the administration gives effect to it."

The Senate version of the foreign trade act calls upon the President to curb imports of oil products if he finds it necessary to curb imports of crude and unfinished oils. It also allows the President discretion as to how to handle any curbs on products.

The Senate measure also sets up new factors for the President to consider in determining whether imports are excessive and thus hurting national security. These factors are regarded as adding a new dose of protection to the trade act.

In addition to Kerr, senators who are conferees and who will help write the final version of the foreign trade act are: Harry F. Byrd (D-Va.), J. Allen Frear (D-Del.), Edward Martin (R-Pa.), and John J. Williams (R-Del.).

House conferees are: Wilbur Mills (D-Ark), Noble J. Gregory (D-Ky.), Aime J. Forand (D-R.I.), Daniel A. Reed, (R-N.Y.), and Richard M. Simpson (R-Pa.).

Carson Says Delta Jumps Gun on Quota

DELTA REFINING CO., Memphis, Tenn., is accused of jumping the gun on its oil-import quota.

Capt. M. V. Carson, Jr., imports program administrator, told newsmen that Delta has confirmed reports it brought in crude in July while its quota didn't become effective until August.

The quota calls for 3,000 bbl. daily of imported crude. Carson said he understands Delta Refining is importing 6,000 bbl. daily, 100% over its quota.

Carson expressed his "regret that the company is not complying with a program which affects the security of the United States."

Carson said June crude-oil imports were 932,200 bbl. daily compared with allocation of 934,100. Districts 1-4 imports were 736,100 bbl. daily against allocation of 713,000. District 5 imports were 196,100 bbl. daily against allocation of 221,100.

Carson said he has named Thomas C. Sneadeker, formerly a petroleum engineer with the Military Petroleum Supply Agency, as his special assistant. He will handle special import studies and projects.

Court action . . . On another imports front, interesting legal precedent is developing on ways to appeal quotas assigned under the voluntary program.

The U. S. Court of Appeals, Washington, D. C., ordered that Eastern States Petroleum & Chemical Corp., Houston, should have another day in court. The company seeks to enjoin enforcement of its quota.

The appeals unit raised the question whether the Government was guilty of "arbitrary action" in dealing with Eastern States.

The appeals court sent the case back to U. S. District Court with directions "to vacate the orders dismissing the complaint and denying the motion for preliminary injunction."

The District Court was ordered to give the Government a chance to answer charges it engaged in "arbitrary action" against Eastern States and directed the court "to promptly hold a hearing for the purpose of determining whether a preliminary injunction, pending trial, is warranted."

New appeals machinery . . . An appeals procedure for companies applying for an oil-import quota currently is under study by the cabinet committee.

The question was talked over at a recent White House conference. The plan calls for giving an importer a second chance at obtaining a quota refused or increasing one assigned.

At present, there is one avenue for appeal—to the Secretary of the Interior, who has been directed to administer the oil imports program.

A new appeals route is being studied as the cabinet committee faces a huge backlog of requests to import additional crude oil.

Steam Wells May Pay Off

DRILLING for steam is about to go on a paying basis in California.

Pacific Gas & Electric Co. has signed a letter of intent with Magma Power Co. and Thermal Power Co. to take steam from Magma and Thermal steam wells in Sonoma and Lake counties for a 12,500-kw. generating plant at Big Sulphur Creek.

Steam from the 600-ft. wells will be piped to the plant turbine at a pressure of 100 psi. and a temperature of 348° F., supplying 265,000 lb. of steam per hour.

Thermal has been drilling these shallow steam wells periodically for several years. The area is about 20 miles north of Healdsburg and about 80 miles north of San Francisco. Additional wells will be drilled.

Phillips Tests Ultradeep Hole

PHILLIPS Petroleum Co. will have the world's deepest producer if current tests at the 1A Montgomery in Pecos County, Texas, prove successful.

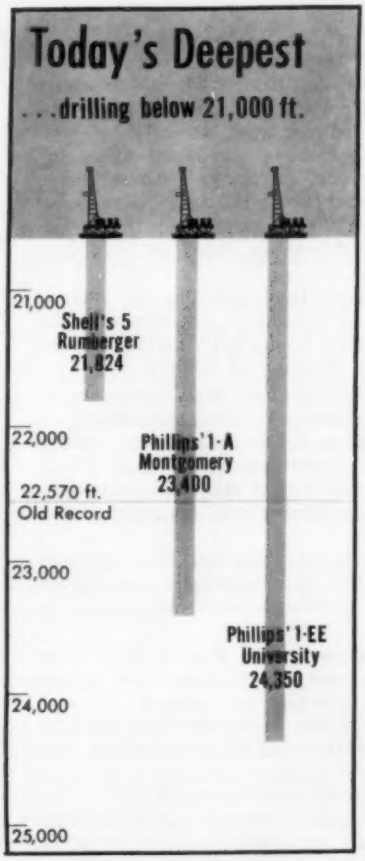
Last week the company was preparing to test open hole at 23,000 to 23,400 ft. in the Ellenburger. The well is the world's second deepest hole. Last month the company set a record string of casing to 23,000 ft. (OGJ, July 28, p. 109).

Just 30 miles away at the 1 EE University, the world's deepest hole, Phillips is probing ahead below 24,350 ft. in the Simpson formation, searching for the Ellenburger, which had been expected around 24,400 ft. The company is making hole at the rate of 30 to 50 ft. per day.

A runnerup in the deep-hole parade, Shell Oil Co.'s 5 Rumberger in Oklahoma's Elk City field, is drilling below 21,824 ft., making an average of about 25 ft. of hole daily.

There is still a question as to whether the bit is in the Springer objective or still in the Morrow. Helmerich & Payne, Inc., is contractor for the wildcat, which is the deepest in Oklahoma. It was contracted to 22,000 ft.

At another deep test in Pecos County, Phillips has perforated the 1A Harral at 18,950 to 19,000 ft. and is preparing to test the Wolfcamp. The hole was bottomed at 19,020 ft.



Gas Well Looks Like a Champ

CANADA'S deepest producer is looking more and more like the country's biggest gas well and perhaps the most significant single find in western Canada's drilling history.

The A-8-4 Berland River, drilled by British American Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., flowed 45,000 M.c.f. of gas daily on restricted choke from the D3 Devonian reef at 12,008 to 12,179 ft.

Some estimate that the big discovery in Central West Alberta has an open-flow potential of 400,000 M.c.f. daily. This would be 112,000 M.c.f. higher than the previous record flow registered at Dick Lake field in Central Alberta.

The big find, which is about 160 miles northwest of Edmonton, is also tagged with two more superlatives. It is the deepest productive reef in the country and the thickest reef ever found (OGJ, July 14, p. 153).

Operators found the Leduc or D3 reef at 12,014 ft. Gross pay thickness is 663 ft, of which 550 ft. is estimated net pay. Production casing is at 12,008 ft.

The flow test was taken from 12,008 to 12,179 ft. which is the top of a fish. There was no packer set on top of fish, so some of the gas could work its way up past it. Total depth of the test is 12,677 ft.

Deeper producer? . . . About 220 miles southeast of the big gas find, Shell is testing another deep gas discovery.

The 1 Panther River in the Foothills Belt flowed 1,000 M.c.f. daily from the second block of Mississippian zone at 12,686 ft. If commercial, it would set a new producing depth record for Canada, taking the title from the Berland River well.

The Panther River well earlier found gas production in the Devonian at 9,000 ft.

Windup in Congress Sees Oil Unhurt

THE 1958 session of Congress hasn't lived up to its advance billing.

It's what Congress hasn't done that is important to the oil and gas industry this year.

The session was slated to be the "big one" for oil. It just didn't shape up that way. The issues were there. But Congress, heading now for a mid-August windup, didn't get around to them.

Aside from stiffening the controls on oil imports, in extending the Reciprocal Trade Act, Congress did very little on major oil matters.

Oil didn't have much chance against the dramatic disclosures of labor racketeering, vicuna coat presents, records that mysteriously disappeared, and allegedly tapped telephone and hotel-room conversations that got the headlines.

Congress, however, did find time to act on some measures of interest to the industry (see box).

Just words . . . Beyond those, there was some talk but little action on matters affecting the industry.

Election year jitters kept the Harris-O'Hara gas bill on ice. At the close of the session it was still lying at the door of the House, where it was dropped toward the end of the 1957 term.

The bill got through the House commerce and rules committees last year by a two-vote margin in each. But House leaders gave the "frayed nerves" of the members as the reason for not bringing it up for vote then.

There were promises this year that the measure would be laid before the House at the "right time," if for no other reason than to settle the issue of federal control of independent gas producers one way or the other. However, the "right time" never came.

Like all other bills not acted upon during the session, the Harris-O'Hara measure is a dead duck. Any further attempt to get the legislation will have to start from scratch. And if Rep. Oren Harris (D-Ark.) wants to revive it next year, he will have to do it alone or get another Republican co-sponsor. Rep. Joseph P. O'Hara (R-Minn.) will not be back.

A number of bills got action in committee but dropped out of the running before final vote could be sought on the House or Senate floor.

The bill requiring that advance notice be given the Government of mergers bringing together corporations with combined assets of $10 million or more was in this group. The measure is of particular interest to the oil industry, which is fighting it because its 60-day delay would make many mergers impossible.

While the measure failed to get action this year, it is almost certain to be revived in 1958, with the full support of the administration behind it.

Also failing of action were watered-down bills to offset the Supreme Court's good-faith decisions.

Bills buried . . . Some measures didn't even get to the top of the desk in committee.

A bill to turn San Nicolas, San Miguel, and Prince islands off the California coast into a fifth naval petroleum reserve got nowhere.

Neither did the Navy's plan to make a contract for a big research program on oil from shale, using the Interior Department's plant at Rifle, Colo.

The same was true, too, of Interior's $224-million helium conservation program.

No session in recent years has been complete without an attack on the industry's depletion allowance. Sen. John Williams (R-Del.) and a small group of backers this year unsuccessfully urged the Senate to cut the rate from 27½ to 15%.

Other proposals that fell out during the session would have provided a 27½% depletion rate for shale oil, made all federal oil and gas leases subject to competitive bidding, set up a National Petroleum Commission, divorced refining from marketing, and started research on making butadiene from grain.

With elections coming up in November, oil men in January expected to get considerable attention from congressional probers.

Not entirely to their disappointment, oil got little attention from investigating committees.

A study of industry influence on regulatory agencies was expected to bring the gas industry into the limelight when a subcommittee delved into the Federal Power Commission.

But a House commerce subcommittee, plagued by internal dissension, found the situation in the Federal Communications and Federal Trade Commissions so intriguing that it never got around to the FPC.

The only other inquiry of note was the second chapter of last year's probe of the Onassis tanker deals. The subject this year was the cancellation by the Onassis interests of contracts to build three tankers under an agreement settling an earlier government suit.

So, with adjournment in sight, the oil industry can breathe easy—until the next session.

Four Bills Mark Session for Oil

- Alaska was granted statehood, paving the way for what may be the biggest oil rush of the last half of this century.
- Taxes were repealed on freight, including the movement of oil and products by pipeline, railroad, and truck.
- The way was opened for Interior Department oil leases on lands under navigable inland waters in those areas in Alaska still held by the federal Government.
- Provision was made for congressional veto of withdrawals of large tracts of land by military agencies, and barred the military from oil exploration except on naval petroleum reserves.

"Crash" Pipeline to Be Laid

SINCLAIR Pipe Line Co. plans a "crash" construction program for its 60-mile, 12-in. crude line from Wichita Falls to Jacksboro, Tex., because of the Middle East crisis.

An economic study of the project indicated a need for 1959 or 1960. But Sinclair management decided to go ahead immediately because of the potential threat to international oil supply. Construction will be completed around September 10. The line will be held in readiness in the event the pipeline industry is called on to aid in another emergency oil lift.

Pipeline capacity to tidewater proved to be a bottleneck in the oil lift to Europe when Egypt's Nasser closed the Suez Canal in the fall of 1956.

The line will permit 43,000 bbl. daily of crude oil from West Texas

and New Mexico to be diverted from the usual northern destinations to the Gulf Coast. The oil can be taken from the Basin Pipe Line System delivery point at Wichita Falls and routed through the 12-in. line to the Jacksboro input station of Sinclair's new big-inch line to Houston.

Borden Report Due

in September. Gas-export recommendation expected.

CANADA'S Borden commission is poring over thousands of pages of evidence taken in hearings on its oil and gas industries. And it's considered almost a foregone conclusion the commission in its interim report will recommend export of more natural gas to the United States.

The initial report in September is expected to deal with proposals for gas export; construction of a proposed crude line from Alberta to Montreal, which is now strictly an import market; and establishment of a national energy board for Canada.

In the final hours of hearings in Montreal, Charles S. Coates, president of Trans-Canada Pipe Lines, Ltd., told the commission that export of Alberta gas to the United States would be profitable for his company. Without export, the rate of return on company sales in 1959-63 would be 5.87%. With the U. S. market it would be 6.75%.

Projects hang in balance . . . The Canadian Government is expected to follow the commission suggestion on gas export.

The decision on availability of Canadian gas will expedite action on a project now before the U. S. Federal Power Commission. Trans-Canada has a contract with Midwestern Gas Transmission Co., an affiliate of Tennessee Gas Transmission Co., to deliver 200,000 M.c.f. daily for distribution in the U. S. Midwest.

The Canadian Government decision also will affect plans for other export projects as well as development of the domestic industry which the projects would stimulate. Westcoast Transmission Co., Ltd., started last year exporting gas to the U. S.

Pacific Gas & Electric Co., San Francisco, also proposes a 1,300-mile, 36-in. line from Alberta to San Francisco to import Alberta gas.

The Borden commission was set up late last year to investigate all phases of energy in Canada. The first phase of the commission's inquiry started in Calgary February 3 and lasted almost 6 months.

watching WASHINGTON

Bertram F. Linz

• Switch from coal to oil is hit

CONTINUED BUILDING or conversion of government heating plants to use oil or gas at a time when Middle East supplies are uncertain is drawing criticism in Congress.

Coal state representatives, of course, are most concerned. They charge that practically all new government buildings are being geared to oil or gas and others are being converted, even in coal-producing areas.

The situation in Iraq merely points up the "folly" of increasing our dependence on foreign oil, it is urged. But the government agencies haven't heeded the warning of months of unrest in the Arab nations, it is charged. They continue to build plants to use the fuel oils which are always in very short supply in wartime.

Defense officials have repeatedly said that coal should be used as far as practicable, at all military facilities, it is pointed out. But their words have largely been ignored.

The Government is spending large sums on oil and gas heating, possibly only to spend still more to shift to coal in the event of an emergency. That's the argument, at least, of Pennsylvania congressmen.

• Antitrust law revision sought

CONSENT-DECREE settlement of government monopoly cases has brought a demand in Congress for a law to "take the profit out of antitrust violations."

A recent study shows that last year 83% of the Justice Department's antitrust cases were settled in this way. The effect, some complain, is to frustrate efforts of small businessmen to secure redress for damages.

Under present law, consent decrees cannot be used as evidence of injury to private parties, as can decrees resulting from litigation. Complainants thus are unable to get the facts needed to support treble-damage suits allowed when a defendant is found guilty of monopolistic practices.

Big companies involved in antitrust cases usually are willing and eager to take consent decrees to protect themselves against private suits, it is charged. The Justice Department is equally willing, on the ground it saves the Government time and money.

The proposed law would require the Justice Department to file with the consent decree an evidentiary statement which would provide a basis for private treble-damage suits.

• Red country embargos due change

CURBS ON exports to the Communist countries will be eased next month. A new policy may open the way for shipments of some types of oil-industry equipment now under embargo.

The expected revision of controls is due to steadily mounting pressure in Europe for freer East-West trade.

The U. S., in the past reluctant to open its gates, is believed ready now to go along with that idea. One reason: Our exports this year will be 15% or more below 1957. Another: Continued opposition might result in Europe deciding to kill the pact under which the free nations have acted in concert, leaving us the sole standout.

Exports to the Red countries now are covered by three rules. One sets up a list of totally banned strategic items and materials. The second sets up quotas for certain goods. The third is materials watched to be sure they are not exported in unreasonably large amounts.

New lists to be issued August 15 are expected to reduce all three groups substantially.

OIL MEN* turn over checks totaling almost $44 million but . . .

Offshore Drilling Must Wait

VARIANCE in offshore California's water depths and ocean-floor conditions will cause a delay in drilling on the tidelands leases which brought record bonus bids.

Four of the five cash bids on the parcels have been accepted by the State Lands Commission. Action on the fifth lease was deferred until the August meeting.

Companies awarded the parcels probably will first drill core holes and stratigraphic tests from floating barges or the West Coast's only mobile platform.

After determining where structural conditions are best for oil, they then will design multiple-well platforms according to the water depths involved. Then drilling can start.

An official in the offshore department of Standard Oil of California says that will be the route it takes. Standard of California, jointly with Humble Oil & Refining Co., is completing installation of its 25-well platform offshore from Summerland. It expects to have the first well drilling late this month.

New start . . . Despite this, the Standard spokesman said it would be necessary to start all over at its two new leases.

This is because water depths, ocean floor conditions, and wave forces may vary widely. Each platform must be tailored to the conditions existing at the site to be drilled.

California's only mobile platform, a DeLong-type barge owned by Offshore Construction, Inc., has been resting at a Long Beach pier since last September.

The contractor is negotiating with two of the successful bidders for its use as soon as preliminary studies are completed.

Bids approved . . . Already accepted by the commission are:

. . . A $13,550,000-bid on parcel A and $5,100,000-bid on parcel E made by the group headed by Phillips Petroleum Co., Edwin W. Pauley, and Kerr-McGee Oil Industries, Inc.

. . . The Standard of California-Humble bid of $12,423,598 on parcel C.

. . . The record offshore bid of $23,711,538 for parcel D by The Texas Co., Monterey Oil Co., and Newmont Oil Co.

Action on parcel B, which attracted only three bids, the highest by Standard of California-Humble for $770,838, was held over until this month's meeting after both the commission staff and consultants recommended it be rejected. An attorney for Standard of California asked for a delay on the decision in order to make further representations to the staff in support of the offer.

*From the left: Edwin W. Pauley, Pauley Oil Co.; Dave Hemsell, Phillips Petroleum Co.; J. H. Puls, The Texas Co.; Ernie Pyles, Monterey Oil Co. California officials receiving checks are, from left, Assemblyman Allen Miller, Lt. Gov. Powers, Finance Director T. H. Mugford, Controller R. C. Kirkwood.

Uranium "Flooded"

by drilling a well, dissolving metal with chemical agent.

THE MINING industry is trying to adopt the oil industry's water-flooding techniques to mining operations.

At a uranium deposit near Grants, N. M., American Milling Corp. already has found that the metals can be dissolved from the ore bodies and pumped to the surface. The next step will be an attempt to push the chemical solvent through 150 ft. of formation and recover the rich solution in a "producing" well.

American Milling, a subsidiary of Yucca Mining & Petroleum Corp., Albuquerque, has drilled two 4¾-in., 2,000-ft. holes in the San Mateo area near Grants after 2 or 2½-in. tubing was run through about 15 ft. of formation.

The string was cemented. The tubing then was gun-perforated on a 5-shot per foot spacing with the bullets penetrating about 3 ft. into the ore body.

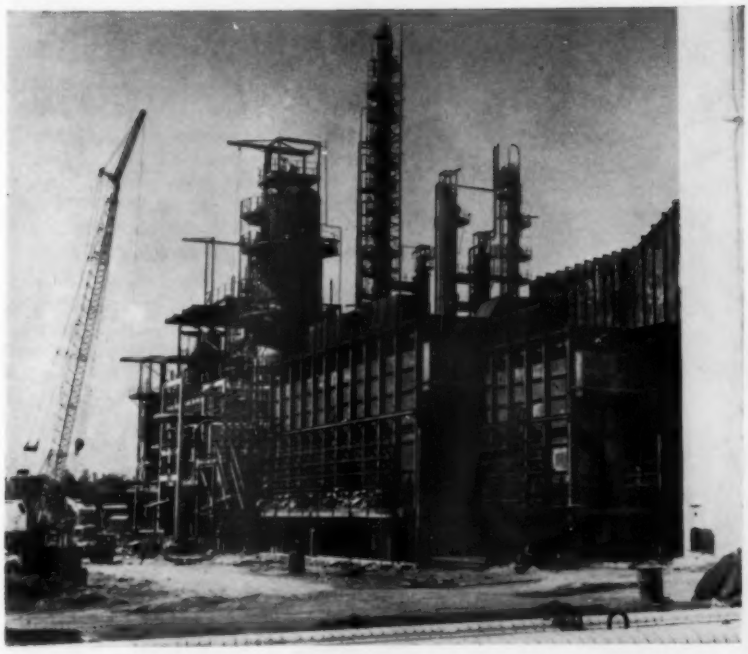
A chemical solution which dissolves metals from the ore body almost upon contact was injected down the two wells drilled 150 ft. apart. In each case about 800 gal. of enriched solution was recovered by swabbing. This was more than was put down the hole, American's president, M. E. Richards, said in announcing the process.

Field testing revealed a show of uranium in the solution. Equally important was the indication that vanadium beryllium and selenium also can be recovered by the process.

Circulation . . . Having verified that the in-place mining method might work as well as it did under laboratory conditions, next step will be an attempt to establish circulation between the two wells.

This phase will be performed by Halliburton Oil Well Cementing Co. under the supervision of its district engineer, William Taylor. If this proves successful a pilot five-spot or similar type "flood" will be started.

Based on the field tests, it is expected that surface pressures will be needed to start the chemical drive moving through the ore body. Water contained in the formation has a static level of about 700 ft. in the two wells. Once under way, however, the fluid column in the injection well may be sufficient to keep the flood moving.



Big Petrochem Plant Nears Completion

CANADA'S rapidly growing petrochemical industry will get a big boost this fall when Imperial Oil, Ltd., goes on stream at its new plant at Sarnia, Ont.

First units in the $28,500,000 complex are scheduled to start up this month. The whole plant is expected to be into operation by next October.

It will produce ethylene, propylene, butylene, butadiene, aromatic distillates, and tar. Shown above are furnaces which are nearing completion.

The new plant is adjacent to Imperial's 77,000-bbl. Sarnia refinery, which is the largest in Canada.

Flood Readied

by Shell Oil Co. for second zone in Dominguez oil field.

WORK IS UNDER WAY in the Dominguez field, in the southwest Los Angeles area, on a water flood slightly deeper than the first-zone flood which has proved so successful.

As soon as a water-treating plant and injection facilities are completed, about 8,000 bbl. daily of waste water will be returned to the 4,600-ft. second zone. When in full operation, the project will have 16 injection wells and 13 producers in an irregular five-spot pattern.

The flood will be carried out in the East Central fault block. As in the first zone, it will be a cooperative project of Union Oil Co., Shell Oil Co., and Dominguez Oil Fields Co. Since most of the second zone underlies Shell properties, Shell will be the operator.

Drilling new wells and reconditioning of old wells already is under way. Included will be injection wells along the common boundary. These will prevent migration.

Water injection in the first zone of the same fault block was started in July 1954. Results of the flood have not been released, but it is known to have been highly successful. A similar response is anticipated from the underlying second zone.

PROCESSING BRIEFS...

El Dorado Refining Co. has been dissolved and will be known as American Petrofina Co. of Texas, with headquarters in Wichita Falls, Tex. El Dorado Refining and its 20,000-bbl. plant at El Dorado, Kans., became a part of the American Petrofina, Inc., family earlier this year when Petrofina acquired the major oil and gas holdings of its parent company, Atlas Corp. (OGJ, Feb. 3, p. 58).

Union Oil Co. is processing about 10,000 bbl. of Hancock Oil Co. crude daily at Union's Los Angeles refinery. A fire at Hancock's Long Beach refinery last May seriously damaged crude processing equipment in the 21,000-bbl. plant (OGJ, June 2, p. 80). Union will supply Hancock with motor fuel, stove oil, diesel fuel, and fuel oil.

Amoco Chemicals Corp. has cut the price of phthalic anhydride 4 cents below the list price of 21 cents a pound. Amoco said the lower price will apply to carloads of bags for delivery on or near November 1, when a new Amoco plant starts production at Joliet, Ill. Amoco is a subsidiary of Standard Oil Co. (Ind.). Phthalic anhydride is a chemical used in making plastics and paints.

Humble Oil & Refining Co. has put on stream the third fluid catalytic cracking unit at its big 282,000-bbl. refinery at Baytown, Tex. The new unit has a rated capacity of 55,000 bbl. a day. It is the refinery's first unit to use gas-driven turbines to furnish air for burning carbon off the catalyst.

Also for Refiners . . .

IN THE NEWS: Temporary pinch has developed in alkylate market due to military demand for avgas. This leaves refiners hard put to meet demands for improved gasoline quality (p. 49) . . . Voluntary imports plan has first birthday—administration claims it is working remarkably well (p. 52) . . . LPG prices have moved up to 5 cents a gallon, much earlier in the season than normal. This may mean another increase this winter (p. 61) . . . Oklahoma and Kansas crude prices strengthen when six purchasers restore 15-cent cuts made earlier in the year (p. 62) . . . OCAW reopens Aurora talks and goes to court in attempt to regain control of local union (p. 65) . . . American domination of world tanker shipping shows signs of slipping (p. 66).

PLUS THESE TECHNICAL REPORTS: What's involved in ethylene storage (p. 74) . . . Refinery construction index (p. 85).

FORE! This is a familiar yell to the crew of a Hudson Oil & Gas Corp. rig drilling at the Los Angeles Country Club. Hudson's operation is one of four that shows . . .

Soundproof Drilling Increases

A DRILLING crew is hardly complete in Los Angeles these days unless it includes, in addition to the usual complement, a landscape artist, a soundproofing engineer, makeup man, and a caddie.

Four rigs currently active on unusual drilling projects in the Los Angeles metropolitan area include these:

. . . **Rancho Golf Course,** where Signal Oil & Gas Co. has cemented 7-in. casing to 9,830 ft. and is drilling below 9,867 ft.

. . . **The privately owned** exclusive Hillcrest Country Club next door to Rancho where Signal also is operator on a wildcat now drilling below 5,605 ft.

. . . **The 310-acre Los Angeles Country Club,** where Hudson Oil & Gas Corp. is drilling below 2,800 ft. on another wildcat (see photo).

. . . **The Twentieth Century Fox** studio lot where Universal Consolidated Oil Co. has a rig at work.

. . . **South of Wilshire Boulevard** where Morgan Brown has reached a depth of 4,000 ft.

In addition Union Oil Co. of California only last week abandoned a wildcat test on Paramount Pictures studio in the heart of Hollywood. The test was taken to a depth of 5,339 ft.

Union officials said that any plans for future drilling will depend upon what an analysis of data from the well shows. The location is in the area of old Los Angeles field and is on a 60-acre parcel, 32 acres of which are held by Paramount.

The landscaping . . . The derricks and drilling facilities for these wells are designed to blend into the landscape and be as inconspicuous as possible.

The derricks are completely encased from crown block to the ground, including the walkaround.

The plastic covers are painted nine different colors, subtly blended from skyblue at the top to foliage green at the ground.

Under terms of the lease, production facilities will be placed underground.

The targets . . . In the cases of the three golf course wildcats, prolific production tapped by Universal Consolidated Oil Co. on the 20th Century Film movie lot in West Los Angeles is the object.

Universal's development is directly between the Hillcrest-Rancho courses and the Los Angeles Country Club links.

Universal set the standard for clean, attractive drilling operations on the west side of Los Angeles with its movie-lot project. Using all electric power and employing extensive soundproofing and landscaping, this operator has completed 18 excellent wells in recent years from a single site on the studio property. The wells are currently making around 1,500 bbl. daily under tight chokes.

Prospects for the two golf courses south of 20th Century—Rancho and Hillcrest—are mixed. It is generally believed the Hillcrest project should find pay. It is a whipstocked hole and probably will be bottomed very near Universal's adjoining movie-lot production.

At Rancho, prospects aren't so promising, according to most reports, although Signal is still drilling.

On both the Rancho and Hillcrest leases, Signal is operator for itself and Richfield Oil Corp.

Hudson's Los Angeles Country Club wildcat is located as near as possible to Santa Monica Boulevard, which divides the course from the movie lot.

Over at the Paramount lot, Union's target was production in the old Los Angeles field. This is one of the original Los Angeles Basin oil fields. Discovered in 1890, it was overrun in the 1920's by residential developments before deeper prospects could be drilled.

At its height between 1892 and 1900, about 1,000 wells were drilled there. Currently 82 stripper wells are producing about 150 bbl. daily.

New Line to Tap Gas Supply

SOUTHERN Natural Gas Co. has started construction on 209 miles of pipeline primarily to connect new gas supply in the South Louisiana marshland and offshore.

Contracts have been awarded to Western Pipeline, Inc., and Brown & Root, Inc., with completion due by December 1. Earlier last month Southern Natural awarded contracts for 484 miles of construction on its Louisiana-Alabama system. The new projects will make available 1,042,533,000 M.c.f. in reserves. Main-line capacity will be increased 298,030 M.c.f. daily.

The Western Pipeline construction includes several different projects: 28.6 miles of 24-in. main-line loop, 46 miles of 20-in., 14 miles of 16-in., 14 miles of 10-in., 23 miles of 8-in., and 6.5 miles of 6-in.

Brown & Root, submarine-line specialists, will lay 16 miles of 20-in., 14 miles of 16-in., 25 miles of 12-in., 2 miles of 8-in., 11.6 miles of 6-in., and 5.6 miles of 4-in.

An announcement

PETROLEUM PANORAMA

The Journal's tribute to the petroleum industry on its One Hundredth Birthday

THE SCENE pictured above has been repeated many times during the past year as editors of The Oil and Gas Journal blended their skill and experience to produce an outstanding contribution to petroleum's centennial anniversary. Nearing completion is a special volume which has held the attention of Journal editors for more than a year—a volume which has called for frequent conferences in which editors have gathered to discuss sources, compare notes, and report progress.

We have named this work Petroleum Panorama. The name is fitting, as the book will unfold to the reader the broad panorama of oil. Historical facts and interpretations will be presented, showing how the petroleum industry in its first century of progress has risen to its now dominant position.

Every subscriber of the Journal will receive a gift copy of this unique separate and complete publication in early 1959.

Oil men everywhere have cooperated with Journal editors in preparing this work. Historical events never previously explained, with illustrations never before reproduced, have been made available by Journal friends engaged in all divisions of oil-industry operations. Much new information has been gleaned from public and private records.

The book is divided into six chapters. The first will highlight the economic, legal, technical, and related happenings which have had a prominent part in determining the course of oil. Others will deal specifically with the technical and operating phases of the five main divisions of the petroleum industry. The scope of these various chapters will be discussed in later issues of the Journal.

Alaskan Lands Reopened

. . . to leasing this fall at higher rental and royalty rates. Gubik and Kenai acreages feature the parcels.

A TIMETABLE for renewed oil and gas leasing in Alaska is being set up by Secretary of Interior Fred A. Seaton.

The Interior secretary announced last week that leasing this fall will cover:

. . . **Sixteen thousand acres** in Gubik gas field.

. . . **Four million acres** adjoining Gubik field.

. . . **About one million acres** in the Kenai National Moose Range.

. . . **Lands beneath** nontidal navigable waters.

. . . **General land** over Alaska totaling more than 12 million acres.

Oil and gas leasing in Alaska was suspended May 2 by Seaton pending passage of legislation which raised oil and gas leasing rentals and royalties to the same level as those charged in continental U. S.

In announcing the new acreage, the secretary also said that "until further notice all lease applications will be processed and handled on a strict time priority basis—first come, first served." In the past, leases were granted on an area basis.

The new charges will be 50 cents an acre rental for the first year for leases applied for after May 3. The old rate of 25 cents an acre will be rate for leases applied for before May 3. Both types of leases will face the same higher royalty charge of 12.5%.

Public Law 85-505, calling for the higher charges, also opened to leasing lands beneath nontidal navigable waters in Alaska.

Preference rights . . . Holders of oil and gas leases which cover any lands under navigable waters, or who applied for such leases by July 3, will have preference rights.

Holders or applicants of such leases will be advised of any preference rights, Seaton said.

In a special notice to be published in the Federal Register, the secretary said he would include a map showing which areas of the Kenai are open to oil and gas leasing and which are closed.

This notice provides for a 10-day period after notation on the official records in the Land Office at Anchorage during which simultaneous applications may be filed to lease the opened lands. Most of these lands are covered by applications that will be adjudicated under regulations of the Department of the Interior.

The notice also will refer to stipulations designed to permit maximum development of the lands for oil and gas purposes, but also fully protect wildlife values of the lands.

The procedure . . . All Kenai applications are to be filed with and handled by the Bureau of Land Management's office at Anchorage.

Seaton also said that leasing can now proceed on about 16,000 acres in the Gubik gas field of north-central Alaska and on the some four million acres adjoining Gubik.

The 16,000 Gubik acres will be available through competitive bids, to be opened at 1 p.m. September 3 in the Interior Department auditorium, Washington.

The four million acres adjoining Gubik will be opened to applications for noncompetitive oil and gas leasing.

Official maps describing the lease blocks of both areas are available in Anchorage and Fairbanks and at BIM headquarters in Washington. They may be bought for $1.50.

The noncompetitive leasing arrangements will allow a 60-day simultaneous filing period following publication in the Federal Register. All applications filed during the 60 days will be regarded as having been filed simultaneously.

These oil and gas leasing operations are the first major openings of northern Alaska lands lying in the area known generally as Public Land Order 82. Under the terms of Secretary Seaton's order modifying Order 82, other lands in this area may be opened to oil and gas leasing from time to time as additional leasing maps are prepared by the BIM and an official notice is published in the Federal Register.

"The opening of these lands to oil and gas leasing and development may be the beginning of important, new economic development in Alaska," Seaton said.

Fowler to Help Carson

RALPH S. FOWLER, formerly oil consultant to the Office of Defense Mobilization, has been named special assistant to the Secretary of Interior for oil imports matters and also assistant director of the Office of Oil and Gas.

As special assistant, he will work with Capt. M. V. Carson, oil imports administrator. As assistant director, he succeeds Carroll V. Fentress, who resigned a few months ago.

Fowler also is reported in line to

PIPELINE BRIEFS . . .

Pacific Northwest Pipeline Corp. has received an FPC examiner's approval to connect 100 billion cubic feet of gas reserves in Rio Blanco County, Colorado. The decision is subject to review by the FPC. The examiner rejected a request by the FPC staff and Western Slope Gas Co. to limit the initial price to 12 cents per M.c.f. The contract price is 15 or 16 cents, depending on delivery pressure. Producers authorized to sell to Pacific are G. E. Kadane & Sons, Wichita Falls, Tex.; Vanson Production Corp., Dallas; James W. Vandeveer, Dallas; Phillips Petroleum Co.; Gulf Oil Corp.; W. W. Vandeveer, Dallas; and Murphy Corp.

Pacific Northwest Pipeline has received temporary FPC authority to build a 51-mile, 30-in. line looping the 16-in. Big Piney lateral in Lincoln and Sublette counties, Wyoming. The $5.5-million expansion will permit Pacific to increase deliveries from Big Piney from 37,900 M.c.f. to 266,800 M.c.f. daily during the next heating season. The company has 2.6 trillion cubic feet of Big Piney reserves dedicated to its line and there is 1.1 trillion cubic feet uncommitted.

The Regina-Steelman gas pipeline of Saskatchewan Power Corp. is expected to be ready for operation this week. The 124-mile, 10-in. line has been completed and is undergoing pressure testing. The 90-mile, 14-in. line linking Many Islands-Hatton gas field with Success is almost complete. The field gathering system is finished and several dehydration units have been shipped.

Alberta Gas Trunk Line Co., Ltd., wound up most of its 1958 construction during the past week, connecting additional fields to supply Trans-Canada. Banister Construction Co. laid

become the government chairman of the Middle East Emergency Committee if that is revived because of "emergency" in the Middle East.

Fowler was director of the voluntary agreement on foreign petroleum supply during the Suez crisis. He was with Arabian American Oil Co. from 1946 through 1954.

O'Mahoney Fears Oil Lift

SEN. JOSEPH C. O'MAHONEY (D-Wyo.) last week warned the government to go slow in triggering off a new emergency oil lift.

In a letter to Secretary of the Interior Fred A. Seaton, he said use of Seaton's proposed plan of action to meet an oil stoppage should begin only with "compelling proof" that it is needed.

With officials of Iraq stating they plan to keep oil flowing, the situation there would not seem to justify use of the plan, he wrote. Further, he expressed "grave doubts" that actual stoppage of Iraqi oil would "justify finding of emergency."

In the event an emergency does arise, the senator wrote, the Government, and not private international oil companies, should operate the oil lift that may be needed. He said he always had doubts as to "the legality" of last year's lift.

The proposed new plan, he said, "actually consists of a delegation to the private companies of the responsibility of the Government itself."

LPG Prices Take Early Jump

LPG PRICES last week took a solid 1-cent jump to match last winter's high of 5 cents per gallon. Chances are good there'll be another increase before cold weather.

The new postings mark an early end to the 4-cent summer discount rate. Last year the price didn't hit 5 cents until December. But this year stocks are lower. Propane stocks, for example, are 115,000,000 gal. below the 1957 midsummer figure.

Phillips Petroleum Co. made its 5-cent price effective August 1 for propane, butane, and propane-butane mix in all areas except the East Coast and West Coast.

Texas Natural Gasoline Corp. increased its price 1 cent effective August 2 throughout the U. S. except for the West Coast, and Sinclair Oil & Gas Co. said its price increase would be effective early this month.

Big demand expected . . . A Phillips spokesman said the demand outlook for LPG this winter is "the greatest ever in history." Phillips, he said, will have sufficient supply to take care of the expected demand.

Last year's stocks were the highest in history, but when severe cold weather hit much of the nation, the supply was quickly consumed.

Midsummer stocks this year, however, are lower than at the same time last year. Propane stocks at plants and refineries totaled 420,000,000 gal. July 15, according to the American Petroleum Institute.

Last year, in mid-July, the API reported propane stocks at 535,000,000 gal. However, both the 1957 and 1958 midsummer stock figures are way above August 1 level in 1956 when propane stocks were 358,762,000 gal.

One reason for greater stocks the past 2 years is the big increase in underground storage capacity. Last year, for example, companies increased storage capacity to more than 1,400,000,000 gal.—nearly 35% more than the previous year's capacity (OGJ, Oct. 14, 1957, p. 101).

Price pattern . . . The price of LPG has fluctuated between 3½ and 5 cents the last 2 years.

In the summer of 1957 propane sold at a discount rate of 3½ cents a gallon. But the low rate ended in September when the price was boosted to 4 cents.

Then two more half-cent increases came last November and December, setting the winter level at 5 cents. This lasted until the first part of April when the new summer discount rate dropped the price to 4 cents. This rate held until last week's increase.

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50 miles of 34-in. and 25 miles of 26-in. The 34-in. is a continuation of the line installed last year and completes this main trunk line. The 26-in. extends from Knode Junction near Princess to near Cessford where it ties into the plant of Hudson's Bay Oil & Gas Co., Ltd.

Piggott Construction Co. finished the south lateral consisting of 150 miles of 24-in. connecting the British American Oil Co., Ltd., plant at Pincher Creek. Preston & Clark has completed laying 25 miles of 6-in. feeder lines to main laterals. Trunk Line personnel, under direction of D. H. Hushion, chief engineer, and E. D. Haverland, pipeline superintendent, have completed cleaning of the lines and initial fill of the Banister work.

Federal Communications Commission has been asked to investigate operation and regulation of public land mobile radio stations and services. Filing the petition were Motorola, Inc., two public mobile radio service operators, and three mobile radio maintenance organizations. They questioned whether major landline telephone companies should be permitted to engage in mobile radio service and how they should be regulated in the public interest. In a related petition the Bell System companies asked the FCC to enlarge the radio spectrum allocated to them for public mobile radio.

Standard Oil Co. (Ind.) plans to build a 23-mile products line, probably 8-in., in the Chicago area and a new products distribution terminal on a 40-acre tract northwest of O'Hare airport. The line will connect with Standard's products system which serves the company's main Chicago terminal. The line and terminal will go into operation in mid-1959.

Also for Pipeliners . . .

IN THE NEWS: Repeal of taxes on pipeline movements one of gains made by oil industry during session of Congress now ending (p. 54) . . . Canada's Borden report, now being prepared, is expected to recommend export of more natural gas to U. S. (p. 55) . . . El Paso Natural lets contract for line to link Aneth field with its system serving California (p. 67) . . . Argentina's drive to develop oil reserves includes pipeline deals with foreign firms (p. 70).

(A complete list of pipeline projects and contractors appears in the last issue each month. New jobs are reported each week in Pipeline Briefs.)

PLUS THESE TECHNICAL REPORTS: Feedback controls on pumping stations (p. 100) . . . How to take a pipeline sample safely (p. 108).

Crude Prices Boosted

. . . in Oklahoma and Kansas as product prices firm up and demand increases. Scattered cuts spotted in other states.

OKLAHOMA and Kansas crude prices strengthened last week when six independent purchasers moved to restore 15-cent price cuts made in the spring.

The purchasers said their price increases, made effective August 1, were based on firming product prices and a stronger demand for crude. The actions generally were regarded as further signs of improving conditions in the oil industry (OGJ, July 28, p. 100).

Involved in the price boosts were:

. . . **Anderson - Prichard** Oil Corp., which advanced its price 15 cents a barrel to $3.15 top for 40°-gravity oil. This covers about 20,000 bbl. daily the company purchases in Oklahoma and Kansas.

. . . **Kerr-McGee** Oil Industries, Inc., which restored a 15-cent a barrel cut it made last March on 45,000 bbl. of sweet crude purchased in eastern Oklahoma. New top is $3.15.

. . . **Champlin Oil & Refining Co.** first advanced its prices for Oklahoma sweet crude by 5 cents a barrel and later followed the trend to the full 15-cents. This makes Champlin's new top also $3.15 on 20,000 bbl. daily.

. . . **Midland Cooperatives, Inc.,** advanced prices 15 cents a barrel on 5,000 bbl. daily of Oklahoma sweet.

. . . **Cooperative Refinery** Association, Kansas City, posted the 15-cent advance on 13,000 bbl. daily in Kansas.

. . . **Vickers Petroleum Co.,** Wichita, advanced its price by 5 cents a barrel on 5,500 bbl. daily and reported it still is studying whether to go the full 15 cents.

The explanations . . . The six companies called their advances consistent with the general improvement in the industry.

Anderson-Prichard noted, however, that the new posting places Oklahoma and Kansas crudes at a disadvantage with the Illinois basin with a $3 top price and the Denver basin with a $2.99 top.

Oklahoma actually has had a double price for sweet crude since April. Cuts made in the spring involved 98,500 bbl. daily which dropped to a $3 top. Other buyers elected to hold the line at a $3.15 top on 150,000 bbl. daily (OGJ, April 28, p. 53).

Subsequent cutbacks in production firmed crude markets by tightening supply with the result that the independents apparently restored their price cuts to forestall possible loss of Oklahoma connections.

Some cuts . . . Downward price adjustments, meanwhile, still are occurring in some other sections of the country.

Continental Oil Co. and Ohio Oil Co. last week followed their competitors who earlier had cut prices in the Rocky Mountain region. Continental reduced prices by 10 cents in Montana and Wyoming. Ohio made the same reductions in the two states.

Two other companies reduced prices 10 to 15 cents per barrel in sections of Arkansas, Louisiana, and Texas.

Gulf Oil Corp. cut the posted price for Delta (Ostrica) crude in southeastern Louisiana by 15 cents per barrel. Top price under the new schedule will be $3.30 for 40°-44°-gravity crude.

Arkansas Fuel Oil Corp. posted reductions of 10 to 15 cents in southern Arkansas, North Louisiana, and East Texas. The cuts affect about 13,000 bbl. daily.

Production pickup . . . Two more states eased off tight controls on crude production for August.

Kansas Corporation Commission set August allowable at 330,000 bbl. daily, up 20,000 bbl. daily from July. This is the highest allowable since February.

Louisiana Conservation Commissioner Ashton Mouton raised that state's August allowable by 42,064 bbl. daily to 809,672. This will be a new high for the year.

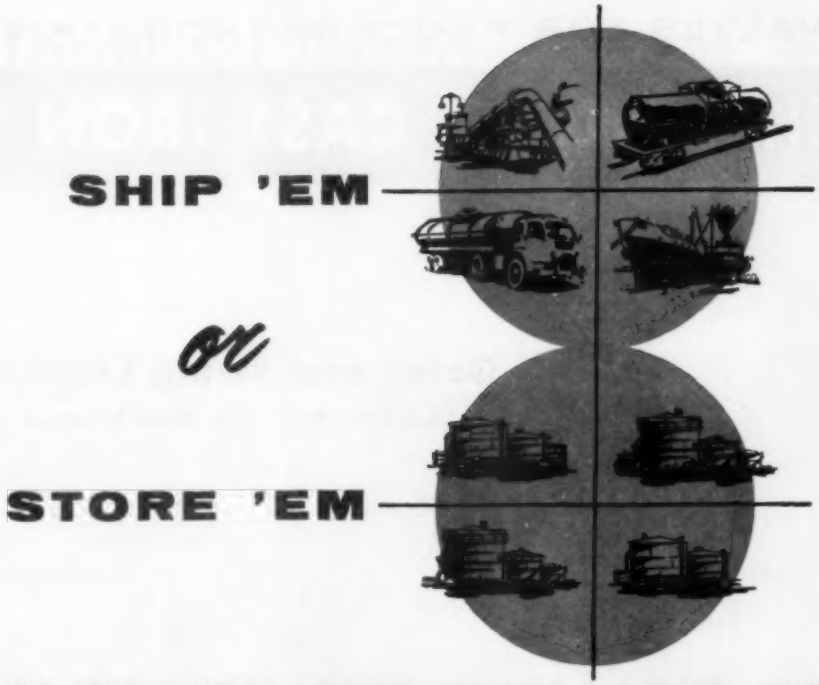
Oklahoma Corporation Commission kept August and September allowables at the July level. Officials estimated the allowable would produce about 560,000 bbl. daily, which is in line with purchaser nominations for the next 2 months.

Sulfur Plant Rising in Gulf Off Louisiana

FREEPORT Sulphur Co. has completed the first phase in construction of a $30,000,000 offshore sulfur plant 7 miles off Louisiana in the Grand Isle of the Gulf of Mexico.

When completed, the platform will be nearly a mile long and will rise 60 ft. above the water. Trucks will travel back and forth between the production platform (upper right) and the larger platform which will support the power plant, living quarters, and various equipment.

The Frasch process will be used to produce sulfur in molten form from 2,000 ft. below the gulf floor. The sulfur deposit was discovered by Humble Oil & Refining Co.



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Fuel oil at *left* is fresh from refinery, bright and clear. *Center*, Nalco-treated oil is bright and sludge-free after four months. *Right*, untreated sample in four months time has darkened considerably, already begun to sludge.

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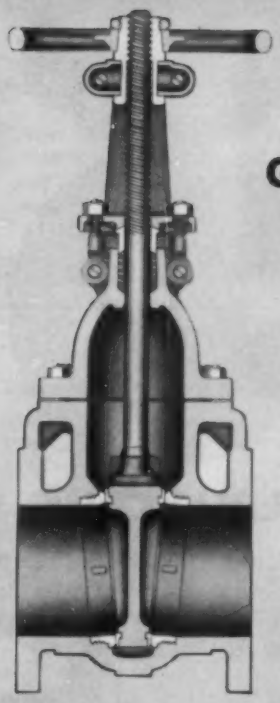
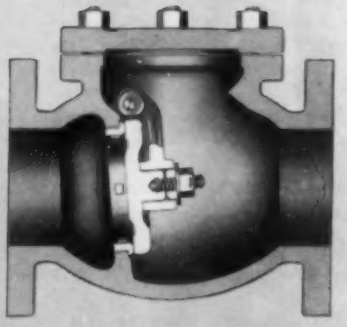


Gates and Swing Checks

18-8 SMo (Type 316) Alloy Trimmed



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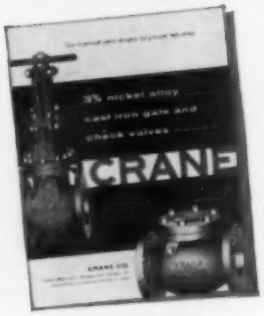

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Dismissal Asked

. . . of price-fixing indictment. All firms except Sinclair join in motion charging grand jury was an "illegal" body.

TWENTY-SIX oil companies last week asked U. S. District Judge Albert V. Bryan to dismiss an indictment charging them with fixing the price of crude oil and gasoline.

The companies said the federal grand jury which returned the criminal indictment was "an illegal and unauthorized body."

Joining in the motion were all the companies indicted last May 29 except Sinclair Oil Corp. and Sinclair Refining Co., both of New York, and Sinclair Crude Oil Co. of Tulsa. However, the Sinclair companies filed separate motions which are similar to the 26-company motion.

Basis for action . . . The motion asserts the jury commissioner did not determine that the jury box contained the names of at least 300 "qualified" jurors, and that some of the names had not been checked for 10 years.

Further, it asserts that the jury commissioner did not verify that the prospective jurors met the tests of 1 year Virginia residence and 6 months residence in the judicial district; of freedom from petit larceny convictions; and of not having a matter expected for jury trial before the court during the term for which the grand jury was called.

Finally, the motion asserts the indictment is "defective" because four members of the final grand jury which returned the indictment were "substituted jurors" who took their places on the body on November 1, 1957, 8 months after the jury was called to study the oil case. The four were present for only one-third of the days the grand jury sat on the case and missed "a substantial part of the evidence."

The indictment was returned by affirmative vote of fewer than 16 of the 23 members of the grand jury, the motion pointed out, a fact which came from the judge at the request of the defendant companies 2 weeks ago. A majority of 12 is needed.

In a memorandum of support, the companies asserted the four jurors were "disqualified from passing upon the ultimate charge" because they had not heard all the evidence.

And, the motion added, "the Government cannot sustain its burden of demonstrating that, after deducting the number of the substituted jurors, the indictment was returned with the concurrence of 12 or more jurors."

The companies asked the Government to admit or deny the statements in the motion, and if they are not denied for the court to dismiss the indictment.

The companies asked if the statements are denied, for the court to fix a hearing date and after hearing dismiss the indictment.

Indiana precedent . . . The argument regarding "qualified" prospective jurors recalls the case against 14 oil companies accused of gasoline price fixing before the U. S. District Court, South Bend, Ind.

Here, the companies complained the grand jury was improperly chosen. It was asserted that some names in the jury box were 5 years old and that the qualifications of all the persons named had not been checked according to federal and state rules.

Agreeing, Judge Robert A. Grant dismissed the indictment on July 18. U. S. Department of Justice officials said they will proceed to seek a new indictment in that case.

OCAW Reopens Aurora Talks

. . . in effort to halt 11-week wildcat strike. Union gets court order to regain local control from rebel leaders.

OFFICIALS of Oil, Chemical and Atomic Workers Union have their hands full with a double job in the 11-week wildcat strike of 327 union members at the Trenton, Mich., plant of Aurora Gasoline Co.

Leaders of the international oil union:

. . . Are reopening negotiations with Aurora representatives seeking to settle the walkout.

. . . Are waging a court battle to regain control of Trenton Local 11-456.

Word from the union last week was that some progress is being made in the negotiations. Meeting with Aurora management are C. S. Shamblen of Chicago, OCAW's District 7 director, and a committee of strikers.

Shamblen was sent to Trenton by OCAW headquarters to take over the local's affairs and try to settle the dispute. OCAW has expelled four local officers for failure to abide by the union's constitution and end the strike (OGJ, July 28, p. 107).

Main roadblock to settling the walkout is disposition of 21 employes fired by Aurora. The company also has filed damage suits against 23 union members, including some of those expelled by the union.

OCAW negotiators have joined the strikers in demanding that all suits be dropped and the men dismissed be given their jobs back.

The intraunion fight, meanwhile, continues hot and heavy. In expelling the Trenton local leaders, OCAW President O. A. Knight accused them of leading an unauthorized strike, blocking attempts to settle the trouble, and conducting a campaign of terror, coercion, and intimidation. Members of the local subsequently gave the ousted leaders a vote of confidence.

OCAW international officers then obtained a temporary injunction forbidding the expelled leaders from interferring with Shamblen's interim administration of the local. They obtained another temporary writ freezing the local's assets and ordering the ousted leaders to surrender the local's records to OCAW.

Other trouble . . . Developments last week in other labor activities affecting the oil industry included:

. . . In Chicago, negotiations were recessed until August 5 between teamster and oil-company representatives over demands for a new contract carrying a 25-cent an hour pay raise for oil-company truck drivers. Little progress has been reported.

. . . In Cleveland, a strike of Teamster Union drivers has curtailed product deliveries to 150 Shell service stations in northeastern Ohio. Strike was quickly settled with new contract providing time and half pay for overtime.

. . . In New York, talks are continuing between representatives of five tanker firms and Marine Engineers Benevolent Association on new wage scale for engineers. The engineers walked off about 100 tankers.

. . . In Lockport, Ill., The Texas Co. has filed unfair labor practices complaint with National Labor Relations Board against the maritime workers local. Members of the local are picketing Ingram Barge Co., in a wage dispute. Texaco refinery workers refuse to load the barge because of maritime pickets.

How U. S. Tanker Ownership Is Divided

Company—	Flag of Registry: U. S.	France	Liberia	Netherlands	Norway	Panama	U.K.	Other	Size of fleet (Dec. 31, 1957): No.	DWT	Change from 1956: No.	DWT
American Trading & Production	6	0	0	0	0	0	0	0	6	99,700	+1	+16,400
Atlantic Refining	11	0	4	0	0	0	0	0	15	302,800	0	0
Barber Oil	8	0	0	0	0	5	0	0	13	274,400	0	0
California Texas	0	3	0	11	0	18	26	0	58	938,000	+1	+32,000
Cities Service	12	0	4	0	0	0	0	0	16	403,100	−1	−16,800
Gulf Oil Corp.	30	0	20	0	0	0	0	6	56	1,175,300	+3	+104,300
Pure Oil Co.	8	0	0	0	0	0	0	0	8	130,000	0	3,600
Sinclair Refining	14	0	0	0	0	0	0	0	14	245,000	0	0
Socony Mobil	15	4	0	0	0	13	2	2	36	745,300	0	+1,100
Indiana Standard	7	0	0	0	0	0	0	0	7	112,700	−4	−66,800
Jersey Standard	38	8	0	4	1	33	25	32	141	2,569,000	+2	+205,400
California Standard	18	0	7	0	0	0	0	0	25	442,800	0	0
Standard Vacuum	0	0	1	4	0	13	10	0	28	455,300	+7	+120,000
Sun Oil Co.	16	0	0	0	0	0	0	0	16	306,900	0	0
The Texas Co.	24	0	0	0	10	11	0	0	45	795,400	0	+23,300
Tidewater Oil Co.	10	0	6	0	0	0	0	0	16	449,300	+4	+211,800
Other Oil Companies	5	0	1	0	0	0	0	0	6	98,000	−1	−17,400
Oil Companies	222	15	43	19	11	93	63	40	506	9,543,000	+12	+616,900
Nonoil Companies	100	0	98	0	0	19	0	1	218	4,632,700	+13	+691,500
U. S. Control	322	15	141	19	11	112	63	41	724	14,175,700	+25	+1,308,400
U. S. Government	148	0	0	0	0	0	0	0	148	2,150,300	+2	+23,600
Total U. S. Control	**470**	**15**	**141**	**19**	**11**	**112**	**63**	**41**	**872**	**16,326,000**	**+27**	**+1,332,000**

U. S. Losing Ground in Tanker Race

THE WORLD'S tanker fleet enjoyed a record expansion last year but American domination of oil shipping showed signs of slipping.

These facts were revealed last week in the annual analysis of the world tank-ship fleet issued by Sun Oil Co. Other trends:

... **Size and speed** of tankers both are still growing.

... **Percentage of tankers** owned by oil companies is dropping.

... **Number of owners preferring** foreign registry is growing.

... **Tanker construction** boom is easing off.

The growth . . . Tank ships delivered in 1957 totaled 198, representing 5.5 million deadweight tons.

These vessels are the equivalent of 358.2 wartime T-2 tankers which still are used as the shipping yardstick.

The Sun analysis declared the 1957 deliveries were the largest ever made for 1 year both from physical capacity and from carrying capacity.

At the end of 1957, the world fleet numbered 2,954 vessels, totaling 50,424,800 dw. tons and equivalent to 2,988.2 T-2's. In terms of carrying capacity, the gain over 1956 was 13.1%.

Tankers controlled by American interests, meanwhile, increased from 841 to 872 ships, totaling 16,326,000 dw. tons equivalent to 1,020.4 T-2's. This was a gain of 9.9% in carrying capacity.

These statistics reveal that although the carrying capacity of tankers under American control is growing, this growth is not keeping pace with growth of the world tanker fleet. Actually, the American-controlled capacity slipped from 35.1% of the world fleet in 1956 to 34.1% in 1957.

But this country still controls more tankers than any other nation. In 1957, U. S. companies had 322 tankers registered under the U. S. flag and 402 under other flags. The U. S. Government also had 148 tankers (see table).

Foreign registry . . . American owners still show a preference for registering their tankers under foreign flags due to cheaper operating costs.

This resulted last year in Liberia moving into first place in tanker registrations ahead of the United States, United Kingdom, Norway, and Panama. Liberia occupied the fourth position in 1956. The switch occurred when almost two-fifths of the carrying capacity added to the world fleet in 1957 was registered under the Liberian flag.

A good portion of Liberia's fleet is under U. S. ownership. American companies own 141 oil-carrying ships under Liberian registry, totaling 3,835,000 dw. tons. These holdings represent 45% of the country's tonnage.

This trend to Liberian registry is expected to continue. The Sun report predicted that over the next 5 years Liberian capacity will increase by 80.9%. In the same period United Kingdom will show an 86.6% capacity gain, Norway 74.7%, Panama

59.3%, and the United States 15.3%.

Slight shifts in the ownership of tankers in the world fleet also occurred last year. Nonoil companies increased their percentage while the percentage of ships owned by oil firms and governments declined slightly.

The 1957 figures were: Nonoil companies 58.6% of the world fleet, oil firms 32.4%, and governments 9%.

A different trend took place, however, in the ownership picture of the U. S. tanker fleet. Both the oil company and government ownership gained at expense of nonoil firms.

Big and fast . . . The emphasis in tanker construction is still on size and speed.

The average tanker in the world fleet is now 17,100 tons, capable of 14.4 knots compared with a 16,200-ton ship, capable of 14.2 knots in 1956.

This gain in carrying capacity is underscored by the increasing number of supertankers being added to the fleet. A supertanker is defined as a vessel of 24,000 dw. tons or more.

During 1957, about three-fifths of the tankers delivered were supertankers. At the end of the year there were 456 such vessels representing 31.5% of total carrying capacity. The year before they represented only 24.7% of total carrying capacity.

Building outlook . . . Construction reports indicate that tonnage will continue to grow faster than the number of ships.

Sun's tabulation shows that more than two-thirds of the 1,116 tankers building or on order are in the supertanker class. These ships total 37,407,000 tons or 75% of present tonnage. The average is 33,500 tons per ship, just about double average tanker size afloat today.

Japan became the leading tanker-building country last year. The 164 ships built in Japanese yards represented 18.8% of the total tonnage. United Kingdom was second, followed by Sweden, Germany, and the United States.

Oil rankings . . . Standard Oil Co. (N. J.) remained far out in front among U. S. oil companies in tanker tonnage.

It had 38 ships under the U. S. flag and 103 under foreign registry. Its 141 ships totaled 2,569,000 dw. tons.

Other ranking companies in this country were: Gulf Oil Corp., 56 ships of 1,175,300 tons; California Texas Oil Co., 58 ships of 938,000 tons; The Texas Co., 45 ships of 795,000 tons; and Socony Mobil Oil Co., Inc., 36 ships of 745,000 tons.

Biggest gain made among the U. S. companies last year was made by Tidewater Oil Co. It added four tankers, a one-third increase in numbers, and 211,800 tons, an almost 100% increase in capacity.

National Bulk Carriers remained well out in front among the nonoil companies. This concern had 32 ships totaling 1,139,500 tons.

Alberta Income Off

due to oil industry's slow first half in province.

THE SLUMP in western Canada's oil and gas industry is dealing a financial blow to the Alberta Government's pocket book.

The government treasury took in $54,813,088 from oil and gas sources during the first half of this year. That's a drop of $15,745,619 from the same period of 1957, and $31,249,595 less than revenue in the first half of 1956.

A breakdown of total revenue for the first 6 months of this year shows:

. . . **Sale of** Crown-owned lands, $25,937,071.

. . . **Rentals** on lands sold, $16,101,857.

. . . **Royalties** from oil, gas, and gas products, $12,774,159.

Transactions during the 6-month period covered rights to 1,176,197 acres of land, a 25% increase over the first half of 1957. But cash payments to the government for oil and gas rights on the lands showed a 25% decrease.

Rentals from the lands were up 2%. Royalties were down 37%.

Revenue from the sale of the lands averaged $22.05 per acre, compared with $38.83 per acre in the first half of 1957, and $117.34 per acre the first half of 1956.

The average price per acre for petroleum and natural gas lease rights this year was $172.47, compared with $795.80 last year.

Reservation rights, meanwhile, are now selling at an average price of $16.32 per acre, almost double the $8.58 per acre price last year. The first half 1956 average price was $24.98 per acre.

Drilling reservations are bringing an average of $6.80 per acre, better than the 1956 average of $5.30, but still below last year's $13.50 per acre.

Natural-gas licenses are averaging $1.91 per acre, compared with $5.07 last year. Natural-gas leases, which averaged $32.53 last year, are down to $21.74 this year.

Aneth Gas Outlet

contracted by El Paso. Gas will move to California.

EL PASO NATURAL Gas Co. has awarded contracts for construction of the line to connect Aneth field gas to its system serving California.

R. H. Fulton & Co. will build 63 miles of 16-in. and 13 miles of 20-in. to El Paso's 24-in. San Juan line. The projects will be completed by October. El Paso will spend $26,080,000 on this project, which also includes 102 miles of field lines, 30,600 hp. in compression; gasoline, fractionating, and dehydration facilities; and wells for its own production.

El Paso expects to take 100,000 M.c.f. daily from Aneth. This large block of reserves, badly needed by the transmission company to meet expanding market requirements, will bring producers 20 cents an M.c.f. the first 5 years and 1 cent more each 5 years thereafter.

Other fields in southeastern Utah and northeastern Arizona will be connected to the new line.

El Paso's compressor-station expansion, scheduled for completion between now and November, embraces these individual projects: Window Rock, Ariz., 22,500 hp., let to Western Pipeline, Inc.; Seligman, Ariz., 10,000 hp.; Aneth, Utah, 6,000 hp.; Chaco, N. M., 10,600 hp., Stearns-Roger; Panoma No. 1, Gray County, Texas, 6,000 hp., C. F. Braun; Panoma No. 2, Collingsworth County, 1,980 hp.; and Sonora, Tex., 2,000 hp., Bowden Construction Co.

Tar-Sands Plant About Ready

UNION OIL CO. is turning to another known source of heavy hydrocarbons, the Sisquoc tar sands near Santa Maria, Calif., to see if they can be economically developed.

The company's research department has laboratory tested a process which shows promise of efficiently recovering heavy oils from the bituminous sands. To further evaluate its commercial possibilities, a 200-ton per day pilot plant is slated to start shakedown operations in August. If the process works as well as it did in the lab, a yield of about 150 bbl. of oil daily will be obtained.

The near-surface Sisquoc sands are located in the vicinity of the company's 20,000-bbl. Santa Maria coking plant. It is expected that coker distillate would be used to dilute the heavy oil so that it could be readily pumped to the refinery.

Production Level Dips

. . . again in May. Free-world output is down in all major areas. Iraq and Saudi Arabia show gains.

FREE-WORLD crude production in May was lower than at any time this year or last.

Output in all major producing areas was shaved, with comparatively small losses in the United States, Canada, Venezuela, Indonesia, Kuwait, and Iran. Gains in Iraq and Saudi Arabia were not able to offset an over-all decline in the Middle East.

Trinidad output passed a milestone with production exceeding 100,000 bbl. daily for the first time. Output on the Caribbean island has inched upward for years under intensive development and exploration, including work in the Gulf of Paria.

Among other smaller producers, West Germany continued to make more progress than any European oil country.

TREND OVER THE LAST YEAR

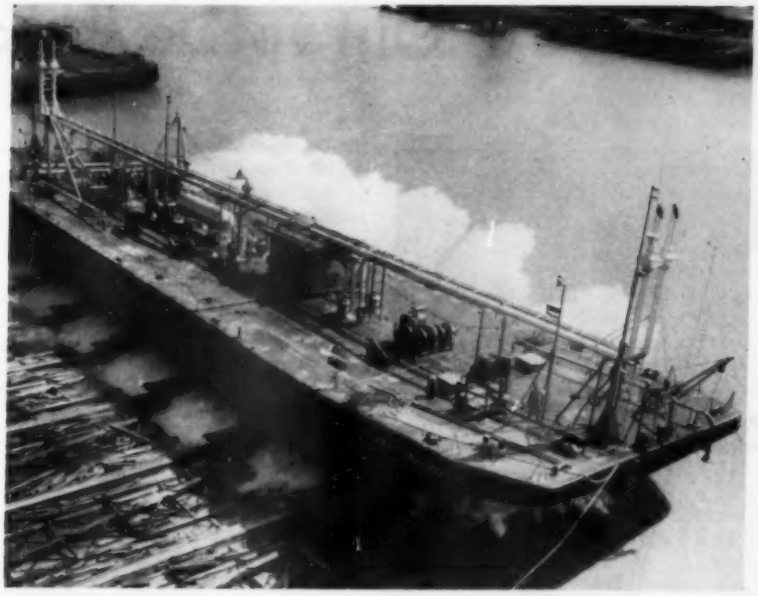
	Western Hemisphere less U. S.	Middle East	Total, Free World outside U. S.
1957			
May	4,107.3	3,555.4	8,407.2
June	4,160.6	3,957.3	8,872.5
July	4,076.2	3,989.4	8,824.7
Aug.	3,924.5	3,955.0	8,649.6
Sept.	3,759.6	3,969.5	8,504.6
Oct.	3,758.8	3,878.9	8,435.5
Nov.	3,654.7	3,704.2	8,142.9
Dec.	3,661.7	3,973.6	8,412.4
1958			
Jan.	3,680.4	4,034.0	8,465.6
Feb.	3,798.7	4,057.6	8,662.1
Mar.	3,672.6	4,243.0	8,631.3
Apr.	3,613.5	4,109.2	8,528.0
May	3,583.7	4,087.8	8,464.5

World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	May 1958	April 1958	May 1957
Western Hemisphere			
Argentina	94.1	94.1	89.5
Bolivia	9.5	9.5	9.5
Brazil	43.5	43.5	18.0
Canada	403.0	405.0	527.2
Chile	14.9	14.9	11.3
Colombia	121.9	121.9	126.0
Cuba	0.9	1.0	1.1
Ecuador	8.6	8.6	8.5
Mexico	255.0	255.0	235.0
Peru	53.1	53.1	51.0
Trinidad	101.0	99.2	93.2
Venezuela	2,478.2	2,507.7	2,937.0
Total	3,583.7	3,613.5	4,107.3
Europe			
Austria	54.4	54.4	61.7
France	27.3	27.3	28.8
West Germany	85.6	82.8	75.8
Italy	27.7	30.6	22.4
Netherlands	28.6	28.6	28.3
Turkey	5.4	5.4	5.4
United Kingdom	1.7	1.7	1.7
Yugoslavia	8.9	8.7	7.6
Total	239.6	239.5	231.7
Middle East			
Bahrain	40.2	40.1	30.1
Iran*	749.0	848.0	702.0
Iraq†	707.9	636.7	416.9
Israel	1.2	1.2	1.2
Kuwait	1,367.3	1,397.9	1,121.4
Neutral Zone	70.0	70.0	59.5
Qatar	172.7	187.0	125.0
Saudi Arabia	979.5	928.3	1,099.3
Total	4,087.8	4,109.2	3,555.4
Other Asia			
British Borneo	119.0	119.0	119.0
Burma	9.2	9.2	7.7
India	8.5	8.5	10.0
Indonesia	320.0	330.0	308.7
Japan	6.8	6.8	6.0
New Guinea	3.0	5.4	6.3
Pakistan	5.9	5.9	5.7
Total	472.4	484.8	463.4
Africa			
Algeria	8.4	8.4	0.3
Egypt	56.2	56.2	44.0
Gabon	8.3	8.3	3.6
Morocco	1.5	1.5	1.5
Nigeria‡	6.6	6.6	.....
Total	81.0	81.0	49.4
Free World			
Foreign	8,464.5	8,528.0	8,407.2
United States	6,233.0	6,287.0	7,442.0
Total	14,697.5	14,815.0	15,849.2
Communist Countries in Soviet Orbit			
Romania	223.0	223.0	220.0
Russia	2,180.0	2,180.0	1,930.0
Others	60.0	60.0	50.0
Total	2,463.0	2,463.0	2,200.0
WORLD TOTAL	**17,160.5**	**17,278.0**	**18,049.2**

*Includes estimated 5,000 bbl. daily from Naft-i-Shah field not operated by consortium companies. †Includes estimated 3,600 bbl. daily from Naft Khaneh field, operated by British Petroleum Co. ‡Test production.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made where complete reports are lacking.



New Barge Will Pick Up Maracaibo Oil

SIGNAL Oil & Gas Co. of Venezuela has a new oil-gathering barge for its new production from a 28,000-acre concession in Lake Maracaibo.

The new vessel, recently completed by Levingston Shipbuilding Co. at Orange, Tex., is called the Centro Lago 2501. Capable of holding 25,000 bbl. of oil, the barge is 239 ft. long, 56 ft. wide, and 15½ ft. deep at both sides.

It will operate in approximately 100 ft. of water in Maracaibo's Block 4. Signal operates the concession for a combine which includes Hancock Oil Co., Pure Oil Co., and Standard Oil Co. (Ohio).

The combine has just extended production 1½ miles southwest on the block. The Centro 6-X flowed 5,880 bbl. of 40.7°-gravity crude daily through 203 ft. of perforations from the C-5 and C-6 zones.

The new producer is southwest of the Centro 4-X, which found pay last spring in several zones below 10,000 ft. (OGJ, May 26, p. 76). Derrick from the 6-X is being moved to Centro 7, a development well near the Centro 4-X.

Sumatra Fracturing Program Expanded

HYDRAULIC fracturing has become an everyday occurrence in the South Sumatran fields of Standard-Vacuum Oil Co.

The widely used fracturing technique in the U. S. was first tried in Indonesia only 2 years ago. Since then pioneering operations with improvised equipment have evolved into a full-scale program with the latest gear. In one 2-month period this year Stanvac averaged 20 wells per month.

Stanvac is the only operator in Sumatra to fracture its wells. It has been impressed by the treatment since the initial trial in Benakat field, when the well responded with a production increase from 25 to 200 bbl. daily.

Stanvac has treated wells in Benakat and Djirak fields and in the Talang Akar-Pendopo area. The success frequency is about 70%, compared with an industry-wide figure of 75%. The company is working to improve the results.

The treatments . . . The dose pumped into a well varies with the wellhead pressure.

The higher the pressure, the smaller the dose. Surface pressures at Benakat and Djirak normally do not exceed 1,500 psi., permitting an injection rate of 13 bbl. per minute.

The usual mixture is 2,000 gal. of breakdown oil, followed by 6,000 to 7,000 lb. of sand mixed in about 6,000 gal. of oil, flushed by 3,500 gal. of oil. Normal crude production from Benakat is about 12,000 bbl. daily and from Djirak, 3,000 bbl. daily.

Surface pressures in the Talang Akar-Pendopo area are higher, usually over 2,400 psi. The dose is pumped in at 5 to 7 bbl. per minute, and quantities are smaller. The area is Stanvac's main source of production in Sumatra, with output of about 35,000 bbl. daily.

Japan Studies Deal

for exploration concession in Egypt. Talks under way.

JAPAN, with its oil appetite already whetted by a concession deal in the Persian Gulf, would like to look for oil in Egypt.

Tatsunosuke Takasaki, Japan's new minister of international trade and industry, said recently a Japanese exploration concession in Egypt may be a part of a $20-million economic cooperation program.

Oil-concession talks first developed when an economic mission headed by Yasuhiro Nakasone, member of the Japanese Diet, visited Egypt last year. Takasaki followed up this mission last January accompanied by Hidezo Aimono, head of the development section of Japan Petroleum Exploration Co.

During that January visit Aimono inspected the Egyptian fields at Ras Gharib, seized from Anglo-Egyptian Oil by the Egyptian Government, Asl Sudr, and Belayim on the Sinai Peninsula.

Nakasone says that the Japanese reached an agreement with Nasser's government "in principle." He believes Japan will get an exploration concession if Egypt's terms are satisfactory. Nakasone described President Nasser as having a "positive attitude" toward the plan.

Coal Plant Production Grows

THE TRICKLE of products from South Africa's coal-to-oil plant is growing, but the government still is not sure when the big development at Coalbrook will reach full production.

The South African Coal & Gas Co. (SASOL) project has cost $130 million so far, with output still short of the design capacity of 5,200 bbl. daily of gasoline.

Output of gasoline is averaging 2,300 bbl. daily, compared with 1,600 bbl. daily last year. Combined output of gasoline and fuel oil at the plant has grown to 2,600 bbl. daily.

Dr. A. J. Van Rhyn, minister of economic affairs, told the national assembly that no part of the capital invested in SASOL is regarded as lost. He said output is expected to keep on growing until capacity is reached.

Argentina Is Going All Out to Develop

• No concessions will be awarded. But drilling and pipeline deals are being made with foreign firms.

ARGENTINA has started twisting the tourniquet that may halt her arterial bleeding to pay for oil imports.

Ultranationalist Argentina has jealously guarded her prospective oil basins for more than 20 years. Any hint of a concession to a foreign oil company was enough to start a revolution. It was just such a move that triggered the downfall of Dictator Juan Peron.

While Yacimientos Petroliferos Fiscales, the government oil agency, plugged away doggedly with little money, oil production inched upward year by year. At the same time oil demand soared. Last year Argentina paid $270 million in foreign exchange it could ill afford for oil imports. The country's own oil reserves could have been developed to supply that oil. But there was no money for development. It had gone to pay for oil the country needed. This year the cost may top $350 million.

No Argentine politician until Peron dared try the obvious answer—inviting a foreign oil company to use its money to develop the oil through the much-hated concession.

Last week, Arturo Frondizi, the country's new president, appeared before his people on a television program. He blamed the oil shortage for the country's economic ills. Then he sprang his solution. It involves contracts with foreign companies to develop Argentina's already semiproved oil reserves. The deals he outlined may involve a foreign investment of more than $1 billion. The word concession was never mentioned. The pattern is the much discussed Yardola Plan (OGJ, June 16, p. 86).

He also said the Russians, in what is regarded as a highly theatrical move immediately before his broadcast began, offered $100 million worth of oil equipment in exchange for Argentine raw materials under a barter agreement. The Soviets recently agreed to supply Argentina 7,000,000 bbl. of crude this year at below market prices (OGJ, July 21, p. 70).

Oil Reserves

A week after Frondizi outlined the plans, the only opposition heard in Argentina was purely political and regarded as minor. Even the most ardent Argentine nationalists have apparently become well aware of the vicious oil cycle they themselves created.

Two of the contracts revealed by Frondizi have already been signed. Half a dozen more are in various stages of completion. Here they are:

...Carl M. Loeb, Rhoades & Co., New York investment banking firm, will spend in excess of $100 million developing oil production in the country's established fields. The fields where the work will be done have yet to be selected.

...Pan American International (Indiana Standard) will spend $60 million developing a 4,000-sq. km. (about 1,545 sq. miles) area in the northern part of Comodoro Rivadavia field.

Primary differences in the two contracts are that Pan Am has a definite area in which to work while the banking firm's activity may take place in several fields. Pan Am will be paid for its work at a flat rate based on the oil it develops payable in both dollars and pesos. Carl M. Loeb will be paid in dollars alone and its return will be based on the market value of the oil it produces.

Here are the contracts still under negotiations:

...A group of companies headed by Floyd Odlum's Atlas Corp. has a package deal calling for the investment of at least $200 million. It might go as high as $700 million before it is concluded.

By far the biggest of any of the contracts negotiated so far, it involves drilling, pipeline construction, financing oil equipment of all kinds, supplying Argentina crude over the next 2 years, building a local plant for equipment manufacture, and underwriting $30 million loan for the Central Bank of Argentine.

...Petrofina, the Belgian company, has a letter of intent to spend $35 million in a development drilling program.

...Sea Drilling Corp. has a letter of intent involving a marine drilling program off the coast of Comodoro Rivadavia in the Gulf of San Jorge. The Louisiana company's deal follows the same pattern as the Pan Am contract.

...Lane-Wells Co. is negotiating a $2.5-million contract calling for drilling and well servicing over a 3-year period payable in Argentine pesos. The contract figure may be doubled. YPF has agreed to secure enough dollars to pay the company's foreign personnel and for any equipment which is imported for use in the program.

...Astra (Cia. Argentina de Petroleo, SA) a privately owned Argentine company, is negotiating a drilling contract and will be paid on a footage basis for its work. Astra has producing properties in the Comodoro Rivadavia region which are depleting rapidly. The company produces only about 2,500 bbl. daily.

...Conorada Petroleum Corp. (Continental, Ohio, and Amerada) has submitted a letter of intent which could lead to a $100-million contract similar to Pan Am International's. No details of the proposal have yet been worked out by Conorada representatives in Buenos Aires talking with government officials.

John Mecom, Houston independent, and Durum, AG, a Swiss firm, reportedly are talking to Argentine officials about a drilling and transportation contract. No details of this program or the amount of money involved have been disclosed.

The Loeb contract . . . The contract Argentina made with the New York banking firm is, at least on the surface, the most attractive from a financial standpoint. The banking firm will be paid in dollars.

The firm last week declined to reveal the identity of its associates in the development program, but concedes that it is primarily the banker for the contract and that experienced oil production help will be needed to carry it out.

A Loeb company spokesman said its contract is the result of a long series of negotiations both with the Frondizi regime and the government of President Pedro Eugenio Aramburu, which preceded the present administration.

Loeb says a country like Argentina with "easily the second largest undeveloped oil reserves in Latin America" and a hungry market for oil was a natural for investment of this kind. The banking firm regards its contract as a very simple arrangement. It is designed to give Argentina the oil it needs by furnishing capital for development with the oil furnishing a profit on the capital in dollars.

The Loeb firm already has geological parties at work in Argentina. Its next move will be to form a joint operating committee with YPF for the selection of areas in which it will drill.

The company gets no money out of its $100-million investment until it produces oil. Then, the returns are more attractive than in any of the other contracts.

The company will be repaid at the rate of 50% of the value of every barrel of oil it produces with the value determined by the laid-down price of oil at Argentine ports. In addition to this automatic amortization on its investment, the banking firm will receive a profit of 15 to 20% based on a sliding scale linked to production. The minimum profit to be paid will be 15% on maximum production.

Pan Am's deal . . . The Indiana Standard subsidiary's contract has a life of 15 years. The company has agreed to drill a minimum of 100 wells in its 1,545 sq. mile area with every possibility that 200 to 300 wells will be drilled.

Pan Am will be paid the equivalent of a flat $10 per cubic meter of oil it produces. This amounts to $1.59 a barrel. Only 60% of this figure, or 95 cents is payable in dollars. The remaining 64 cents will be paid in nonconvertible pesos.

This flat price for all oil produced is subject to revision based on world oil market prices at the end of the first 5 years of the contact.

Pan Am has also agreed to build a pipeline from the production it develops to a point of delivery to be selected by YPF. Since the area is near the Atlantic Coast, the line probably will be terminated at some point on this coast.

Neither the Loeb firm nor Pan Am will at any time during the life of the contract have title to any of the oil. Ownership of the crude is strictly in the hands of YPF.

The Atlas group deal . . . The six-company group involved in the biggest development contract includes four companies controlled by Odlum.

The Odlum firms are Atlas Corp., Hidden Splendor Mining Co., Petro-Atlas, Inc., and Mid-Continent Exploration Co. The other two companies are Williams Brothers, Tulsa pipeline construction company, and Ferrostal, AG, a German pipe mill.

The oil producing properties in the U. S. controlled by Petro-Atlas Corp. were recently sold to American Petrofina, and Petro-Atlas, Inc. was organized to control undeveloped oil leases in this country held by the Odlum interests.

This group's contract, which is still being negotiated, is by far the most

complicated of all those revealed by Frondizi. It is basically a drilling contract in which the group agrees to drill up to 4,000 locations in Comodoro Rivadavia to be selected by YPF. The drilling will be carried out over a 6-year period and the group will be paid in both pesos and dollars with a guaranteed 4.75% return on its investment.

The group will furnish Argentina $50 million worth of all types of oilfield equipment over a 3-year period, with payment for the equipment to begin at the end of the 3 years and extend through the sixth year at the same interest rate.

The combine will build a natural-gas pipeline from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. The line will follow the route of a 10-in. gas line built in 1947. It has not been decided whether the old line will remain in service or be taken up.

The new line will be 26 in. in diameter to the connecting point for the Plaza Huincul link and 30 in. from the connection on to Buenos Aires. Diameter of the spur to Plaza Huincul has not been decided.

Williams Brothers will do the construction work and the German pipe mill presumably will furnish $100 million worth of pipe for the job.

In the first 2 years after the final contract is signed, the group of companies agrees to furnish Argentina 17,600,000 bbl. of crude to help meet the country's crude needs before the big development drilling program begins to show results. The government has an option to increase this to 35,200,000 bbl. over a 3-year period.

Argentina will pay for the crude 20% on delivery with the balance to be paid in installments every 6 months. The Atlas group is guaranteed a 4.75% interest on this deal, too.

YPF officials estimated last week that the Atlas group's drilling in Comodoro Rivadavia alone should net the country 146,000 bbl. daily by the end of 1964. YPF estimates that the program will yield the natural gas equivalent of another 70,000 bbl. daily of crude.

During the first 6 months of this year, YPF and the three companies still operating small prenationalization concessions in the country averaged only 95,000 bbl. daily with the bulk of the production coming from YPF fields. Last year Argentina supplemented this production with almost 177,000 bbl. daily in crude and products imports.

The Petrofina contract . . . The contract still being negotiated with the Belgian oil firm is the one which puzzles U. S. oil and financial circles the most.

While the deal is still not firm, Petrofina has reportedly agreed to spend $35 million in a development drilling program in an area to be selected by YPF. There is well founded speculation that Petrofina will work in the Plaza Huincul region of Neuquen in western Argentina.

The puzzler in the contract terms as they are now known is the rate of compensation. Petrofina has reportedly agreed upon a return of $2 per cubic meter of all the oil produced, payable in dollars, pounds sterling, Belgian francs, and pesos. This is only about 32 cents a barrel.

The contract calls for drilling 200 wells with the drilling equipment used to become YPF property as soon as it is amortized.

Earlier deal still on . . . An American company that managed to land a drilling contract in Argentina long before President Frondizi adopted the Yardola Plan will soon be drilling in Argentina.

Laughlin - Porter Drilling Co. of Midland, Tex., is scheduled to ship two rigs from Houston to Buenos Aires in September. The Texas company has a 40-well, $3,000,000 contract for development work on the island of Tierra del Fuego at the southern tip of South America (OGJ, Oct. 28, 1957, p. 84).

Laughlin - Porter signed the deal with the Argentine Government in October 1957. Atlas Corp., Williams Brothers, and some of the other companies that have apparently landed new contracts with Argentina tried to get their foot in the door when Laughlin-Porter succeeded. However, the Laughlin-Porter contract broke the ice in Argentina for foreign investors. Later, a group headed by Fish Engineering Co. of Houston landed the contract to build two pipelines from Campo Duran in northern Argentina.

All 40 wells to be drilled by Laughlin-Porter will go for developing the shut-in Rio Aviles and Arroyo Gama fields discovered by YPF on the northern portion of the island. If, however, these fields should be defined before 40 wells are drilled, the remainder would be drilled as wildcats elsewhere on the island.

Phillip E. Laughlin, Jr., Laughlin-Porter president, told the Journal last week that it will take about 2 years to complete the drilling job.

His agreement with the Argentine Government was negotiated in the form of a straight footage contract. The contractor will furnish the rigs, supplies, drilling mud and chemicals, cement and cementing equipment, labor, and supervision. Argentina will supply the pipe and logging and perforating services.

Attempted Coup Helps Junta

AN abortive military coup that might have overthrown the temporary ruling junta in Venezuela was halted by the very element that usually makes such moves successful—public demonstrations.

Admiral Wolfgang Larrazabal, the man who has headed the group governing Venezuela since Dictator Marcos Perez Jimenez was overthrown, has passed his first big crisis. It was nip and tuck for a few days, but the Larrazabal government emerged on top with the help of demonstrating crowds in Caracas.

A throng estimated at from 30,000 to 50,000 mobbed the Avenida Urdaneta chanting support for the Larrazabal government. The action doused the enthusiasm of the dissidents and forced the resignation of the minister of defense, Gen. Jesus Maria Castro Leon, who found it wise to catch a plane for Miami with a group of his supporters.

Communists involved . . . Castro Leon was supported by a group in the army which thought the Larrazabal government is too lenient on Venezuela's communists. Some of the group complained that the government was letting the political party, Accion Democratica, get too strong.

Some cynical Caracas observers wondered if the July 23 general strike called in support of the existing government would have been so successful if many of the workers had not had a chance to make a 2-day holiday out of Simon Bolivar's birthday on July 24.

When it was all over Larrazabal's temporary government was stronger than ever. So was the COPEI political party, because its leader, Rafael Caldera, helped persuade Castro Leon he had to resign to avert bloodshed. Romulo Betancourt, president of Accion Democratica, did not appear at the triumphant rally. The communists, the butt of the whole affair, emerged stronger than ever when the coup failed.

75-25 Split Signed

. . . by Italians and Morocco. Partnership company will explore 11,580-sq.-mile concession under new oil law.

ENRICO MATTEI, powerful head of Italy's state-owned oil agency, has signed another "75-25" oil concession deal.

Mattei, who first breached the traditional 50-50 profit split formula in the Middle East, has done it this time in North Africa.

Ente Nazionale Idrocarburi has agreed to form a joint exploration company with Morocco to search for oil over 11,580 sq. miles in southern Morocco. ENI will put up all the exploration costs, split the profits once with the country in the form of taxes, and once again as an equal partner.

The agreement was signed in Rabat after months of negotiation. It was wrapped up almost simultaneously with a new Moroccan oil law (OGJ, July 14, p. 87).

What's involved . . . Few details of the new Mattei deal were made public last week, but sources in the Moroccan ministry of national economy said it covers virtually the same requirements in the new general oil law.

The government sources said the new law requires minimum expenditures of $4,500,000 during the first 4 years of an exploratory concession and $1 million a year for the next 8 years.

The ENI deal will cost the Moroccans nothing for the partnership. The Italians will be allowed to regain their exploration costs at the rate of 10 cents a barrel from all oil found and produced.

The new joint company will be called Ste. Anonyme Maroc-Italienne des Petroles. It will be headed by Mohammed Zeghari, who resigned last week as Moroccan ambassador to France.

The area in which the new company will operate is the southen region of Morocco called Tarfaya, including coastal waters. This region, extending eastward from the Atlantic, is south of Oued Dra. It is in what was once the southern protectorate of Morocco, only recently reunited to the northern portion when the Spanish withdrew from the area.

Moroccan production . . . Oil production in the former French colony is of post World War II vintage.

Ste. Cherifienne de Petroles (SCP) made the first discovery in 1947. Since that time the company has developed a whole series of small pools producing from 900 to 5,600 ft. All of them are in the Rharb area east of Rabat.

In spite of pretty intensive development drilling in this area, production has declined steadily from an average of 2,200 bbl. daily in 1956 to 1,600 bbl. the first half of 1958.

SCP has about 8,494 sq. miles in exploratory acreage in three small blocks in addition to the Rharb producing area. All of it is to the north of the region to be explored by the Italian-Moroccan company.

IPC Expands Pipeline System

IRAQ Petroleum Co., which recently restored capacity of its Mediterranean system to 500,000 bbl. daily, is under way on another expansion program.

Additional pumping capacity has been provided in three stations in Iraq and one in Syria, returning capacity to the level prior to destruction of three pump stations during the Suez crisis. The company constructed 17 miles of 30-in. between T.1 and T.3 stations, 57 miles of 30 and 32-in. near T.3, and 28 miles of 24-in. near Homs, Syria.

IPC pumps 350,000 bbl. daily through the 30 and 32-in. Kirkuk-Banias, Syria, system, and 150,000 bbl. daily through the Kirkuk-Tripoli, Lebanon, 12 and 16-in. lines.

The system will be expanded to 560,000 bbl. daily early next year by construction of 76 miles of 30 and 32-in. loops on the Banias line.

Japan Expands New Field

THE LATEST well in Japan's new Tamugiyama field has been completed with a flow of 88 bbl. daily through ⅛-in. choke.

Tamugiyama 8 initially tested at the rate of 756 bbl. daily through ½-in. choke from 4,460 ft. It flowed at the rate of 252 bbl. daily through a 12/64-in. choke on a later test.

The well is a 3/5-mile stepout from the No. 7 well in the year-old field in Niigata prefecture.

Japan Exploration Co., owned jointly by the government and Teikoku Oil Co., is the operator.

——World briefs

The two largest producers in Peru have decided to substantially reduce field operations because of government failure to raise product prices to economic levels. The two firms, Cia. Petrolera Lobitos and International Petroleum Co., produce most of Peru's 53,000 bbl. daily.

Scandinavia's biggest tanker has been delivered to a Norwegian shipping firm, Anders Jahre & Co. The new 44,000-ton vessel, Jakinda, was built in West Germany, and will sail under charter to Eagle Oil Co., London.

Sun Oil Co. of California has applied for exploration permits on several areas of New South Wales, Australia. Work will begin in the Cessnock region, north of Sydney.

The 31,800-ton Caltex Cardiff launched at Hoboken, Belgium, is the largest tanker ever built in the country. Caltex has on order a sister ship and two 45,000-ton vessels from the same yard.

Air cooling will be used almost exclusively in two big European refineries being built by subsidiaries of Standard Oil Co. (N. J.). The systems are being installed in the new 95,000-bbl. Dutch plant at Rotterdam and the 100,000-bbl. plant at Milford Haven, Wales. They are believed to be the first major refineries designed to have all units cooled by air. Air-fin coolers were selected for economic reasons, figured on the basis of investment and maintenance.

A new Dutch shipyard has launched the first vessel in the National Iranian Tanker Co. fleet. Verolme United Shipyards built the 33,000-ton Reza Shah The Great in a new yard on an island near Rotterdam. Another 33,000-ton tanker is being built for Brazil. The company also has orders for four 47,000-ton ships for the Jersey Standard group.

Russia boosted oil production 17% and natural gas 61% during the first half of the year. Crude production averaged slightly more than 2,000,000 bbl. daily up to July 1. Natural-gas production took an even more startling jump—to about 2,550,000,000 cu. ft. daily. Moscow released figures last week to show that the country's over-all industrial production rose 10.5% over the first half of 1957.

What's involved in ethylene storage

"If the producer wants to maintain a more or less independent position, the storage capacity should be at least equivalent to a week's production, and an even greater capacity would relieve him of concern about meeting delivery obligations."

BY H. C. SCHUTT AND A. R. MATTIOLI

A GREAT NUMBER of oil-refining companies, in this country and abroad, have undertaken in recent years the processing of refinery residue gas for production of ethylene. These are relatively large-capacity installations set up to satisfy requirements of several chemical-synthesis operations or organic-chemical manufacturers making a variety of ethylene derivatives.

A prime necessity in such operations is continuity of material flow to numerous chemical process units operating on an independent production schedule. This involves more or less extensive facilities for storage, transportation, or distribution. It is the purpose of this article to review the technical and economic aspects of such installations as part of or as an adjunct to ethylene-production plants.

1. SOME BASIC FACTORS

The principal consideration in providing intermediate product storage between successive process units or plants is to lessen their interdependence in an integrated manufacturing establishment. When separate companies are involved as ethylene supplier and consumer, adequate storage facilities are essential for maintaining more or less complete independence of plant operations.

All process units have different operating characteristics dictating their stream efficiency and causing cyclic variation in feed demand or periodic shutdowns of varying durations. Storage of intermediate streams provides for orderly execution of operational changes and avoids waste of materials inherent in sudden changes of flows and shutdown of individual production units.

There are two general situations which distinguish the type and scope of storage facilities to be considered:

1. The integrated chemical-manufacturing plant producing its own olefins.

2. The large producer of olefins selling the product on demand to several chemical manufacturers.

Bulk Storage-Volatile Hydrocarbons

Ethylene is a normally gaseous hydrocarbon, or when in liquid state, it can be termed "highly volatile." The problems associated with storing it are essentially not any different from those encountered when containing light hydrocarbon fuels such as natural gas (mostly methane), LPG (mostly propane), butane, and natural gasoline. The installations at present in use for storing these volatile materials have been evolved through consideration of the numerous technical and economic aspects involved.

Types of existing facilities . . . A brief survey of such existing facilities will help to narrow down the choice of ways for storing ethylene. Table 1 has been prepared from data on hand and published information[1 2 3 4 5 6 7 10 12 13 16 17] giving the average capacity and cost of various types of storage facilities for volatile hydrocarbons. A wide range of temperature and pressure conditions are encountered in these installations: pressures as high as 2,500 psi. and temperatures ranging from atmospheric to as low as —250 ° F. liquefied natural gas at low pressure.

Tanks aboveground . . . These[9] represent relatively expensive containers for volatile hydrocarbons and the most efficient use of such valuable storage volume is made if the hydrocarbons are contained in the liquid state. This involves low temperatures, for natural gas in the order of —250° F., and for ethylene having a critical temperature of 50° F., storage temperatures in the order of —20° to —100° F., corresponding to pressures of 275

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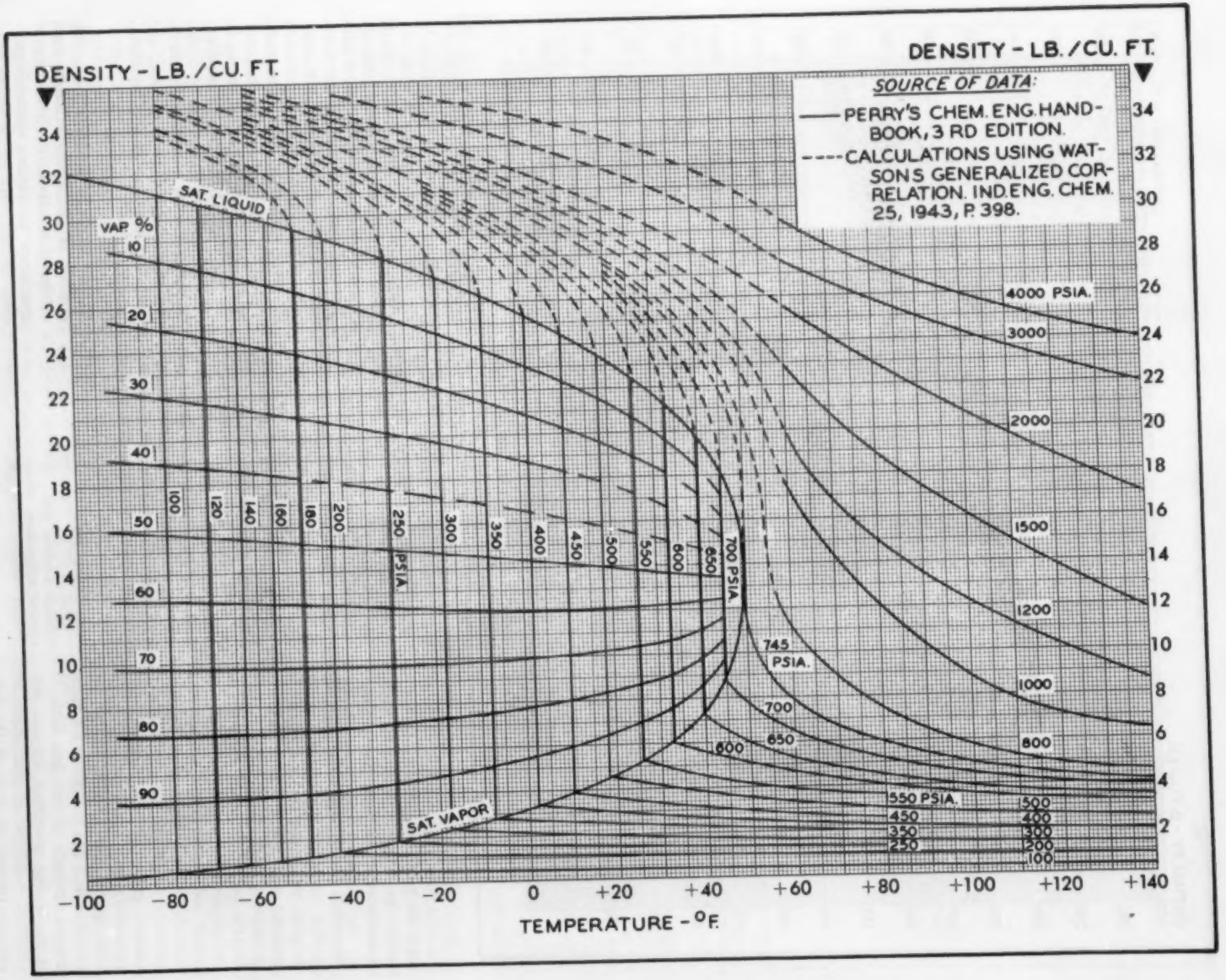
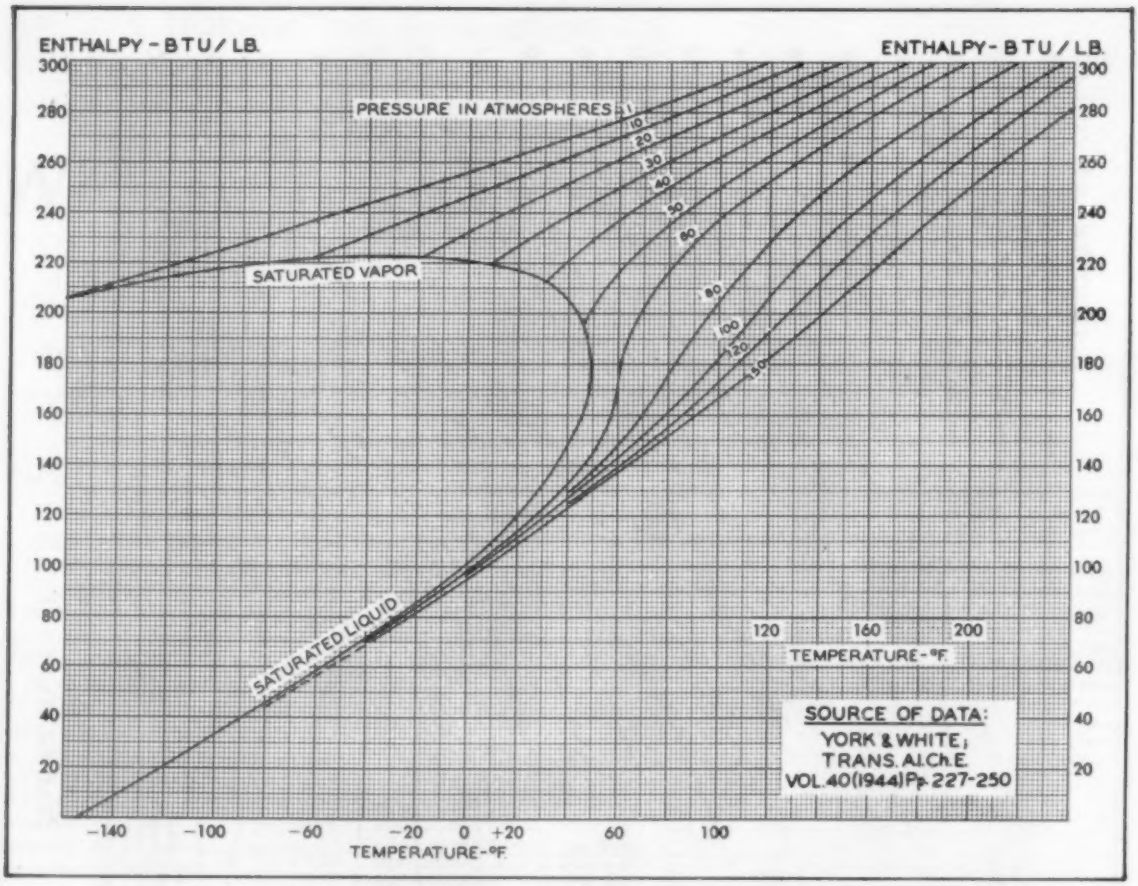
This three-part series supplements an earlier series by Schutt and Zdonik on ethylene manufacture—feed stocks, compression and pretreatment, pyrolysis and ethylene recovery—which ran in six parts in The Oil and Gas Journal during 1956. This series has now been reprinted in a new Journal petrochemical manual which also includes a series on butadiene manufacture and other petrochem articles and is available from Reader Service Department at $2.00 per copy.



DENSITY of ethylene (liquid and vapor state.) Fig. 1.



ENTHALPY of ethylene (liquid and vapor state). Fig. 2.

and 50 psig., respectively, appear to cover the economic range of storage conditions in insulated tanks.

Materials for storage tanks . . . The design problems, principally metallurgical, and uncertainties formerly associated with the design of low-temperature storage facilities,[8 11 15] have largely been eliminated through the development of steels with fully reliable and reproducible low-temperature ductility. Table 2 gives the temperature range for the application of various grades of steel according to present-day practice. The low temperature specification ASTM A300, referred to in Table 2, requires a Charpy impact strength of not less than 15 ft.-lb. at the minimum service temperature. A number of other steels are suitable for use in each of the low-temperature ranges. But, for reasons of availability or cost, these are less commonly used than those shown in Table 2. No low temperature specification is indicated in the table for ASTM A240, Grade S steel, the reason being that this austenitic material (in wrought form) possesses such reliable low-temperature properties that low-temperature testing is seldom called for.

Physical Properties of Ethylene

For the expedient and accurate evaluation of ethylene storage facilities, data on the physical properties of ethylene over a wide range of temperatures and pressures are required. Fig. 1 gives the density of ethylene in vapor and liquid state and Fig. 2 the enthalpy for the same range of conditions. In addition, the following specific properties will be useful in engineering studies of ethylene storage and distribution systems:

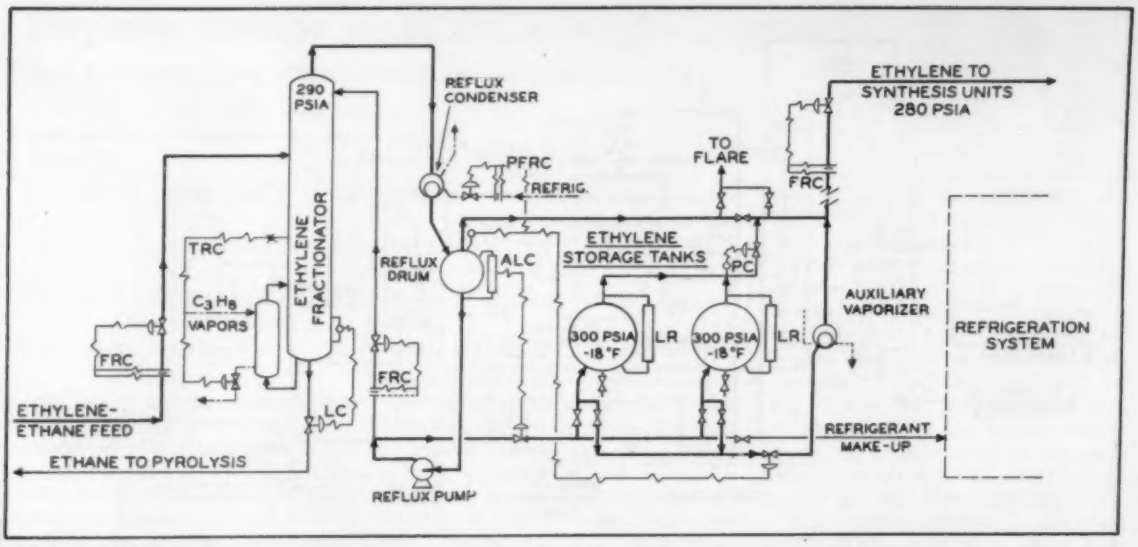
Atm. boiling point (14.7 psia), °F.	—154.7
Critical pressure, psia.	742.1
Critical temperature, °F.	49.8
Critical volume, cu. ft. per lb.	0.0705
Flammability limits (vol. % C_2H_4 in air):	
Lower	3.05
Higher	28.6

Large Storage Capacity Advantages

The production of ethylene from refinery residue gas is increasingly practiced by large refineries in this country and in Europe. This operation adds another quality product to the long list of salable commodities derived from crude oil and natural gasoline and thus raises the utilization factor of these most valuable raw materials. Ethylene or olefin manufacture by large refiners is a rather profitable operation. The residue gas has normally only fuel value, which is set by the price of natural gas or heavy fuel oil; and the production of olefins is performed on a large scale resulting in relatively low investment and operating costs per pound of olefins produced.

Central ethylene producer . . . The number of chemicals derivable from olefins is manifold. But the scale of operations for various synthesis processes is relatively small when compared with the oil-refining operations. Thus the olefin demand of several manufacturers can be satisfied and the production is sold to a number of chemical plants in the vicinity of the refinery, either already in existence or newly built, for the distinct reason of the availability of low-cost hydrocarbon raw materials.

The olefins supplied under a long-



ETHYLENE RECOVERY with storage capacity. The PFRC is a pressure reset recording flow controller. Its function is to control flow of refrigerant to reflux condenser and is reset by pressure in reflux drum which is related to tower operating pressure. Fig. 3.

term contract at a certain cost must usually be delivered on demand and at a steady rate within a maximum and minimum flow stipulated in the contract. This provision is an insurance to the chemical manufacturer that his plant can operate at its maximum production efficiency.

Large storage needed . . . When the ethylene producer is contractually bound to supply ethylene or propylene to several customers, then it is absolutely necessary to provide relatively large storage facilities. This enables deliveries to be maintained when the ethylene plant is not running at full capacity, due to temporary reduction in refinery operations, or when the ethylene plant itself has to be shut down for inspection and maintenance repairs, which normally occurs once a year.

What is adequate storage? . . . It is difficult to state what constitutes an adequate storage capacity, since it will vary from case to case. If there is some sort of a cooperative understanding between the producer and the consumer whereby the latter will curtail their raw material demand for a week while performing some equipment inspection and repair work themselves, then a storage reserve equal to approximately 4 days of the normal production may be adequate.

But if the producer wants to maintain a more or less independent position, the storage capacity should be at least equivalent to a week's production, and an even larger capacity would relieve him entirely of any concern about meeting his delivery obligation. Also, large storage reserves would place the olefin producer in the position to contract for the maximum obtainable output of the ethylene plant; in other words, enable him to sell as much ethylene as he possibly can make at the best price.

Storing Large Quantities of Ethylene

When surveying the storage facilities at present in use for creating large reserves of commercial hydrocarbon products (Table 1) it becomes apparent that for the containment of ethylene the following types of storage installations should be considered:

1. Insulated tanks aboveground.
2. Subsurface pipe or pipe sections.
3. Dissolved caverns in salt strata.

For storage pressures in the order of 200 psig., the horizontal cylindrical tank would be more practical than the spherical.

Subterranean space formations such as natural caverns and depleted oil and gas fields, or man-created cavities such as abandoned mineral mines and special underground excavations are increasingly used today for storing oils and volatile hydrocarbons such as LPG, butanes, and natural gasoline. These storage reservoirs are usually of large capacity and offer excellent means of balancing supply and consumer demand over long periods of time.

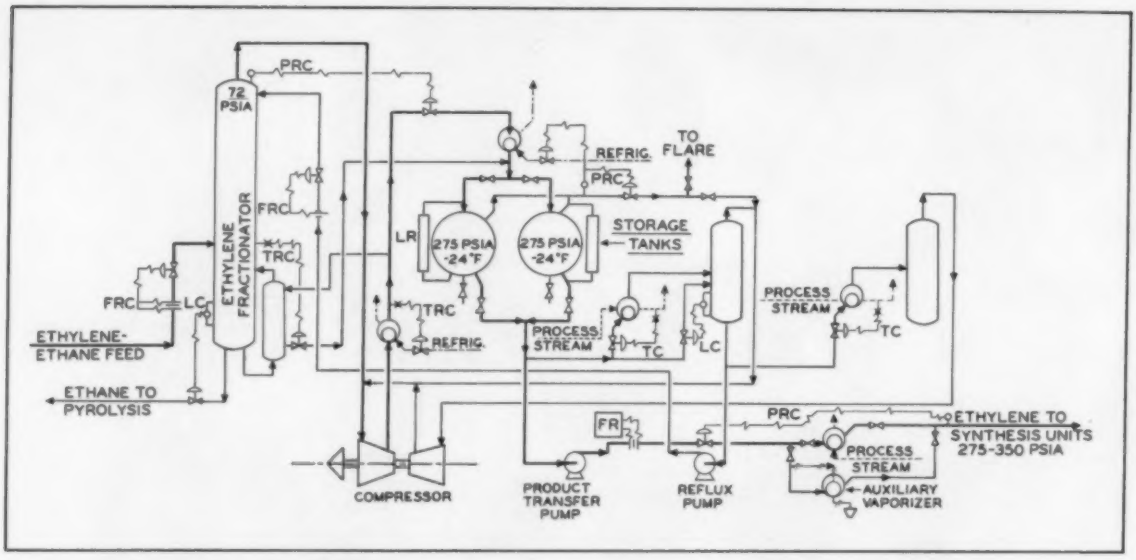
Pure and concentrated ethylene is a relatively high-cost product, and losses and the slightest contamination in storage cannot be tolerated. Therefore an underground cavity for ethylene containment must have impermeable enclosures. And the only cavities which offer these are those washed out of salt strata or domes. These formations occur in many regions of this country and are especially extensive in the Gulf Coast area where also the present ethylene production and the future potential are the greatest.

2. LIMITED STORAGE FOR INTEGRATED PETROCHEMICAL PLANT

A plant producing olefins from petroleum hydrocarbons and manufacturing such salable chemical commodities as alcohols, oxides, glycols, ethers, amines, halogenated hydrocarbons, alkyl aromatics, polymers, and secondary derivatives, as the case may be, fits the description of an integrated petrochemical plant. It has usually a general manager of manufacturing who coordinates all unit operations on the basis of product demand, as well as the operating characteristics and capacities of the individual process units.

Flexibility . . . A fairly large ethylene plant with a design production capacity in the order of 200,000 lb. per day has, as a rule, considerable flexibility as far as production load is concerned. It embodies a multiplicity of pyrolysis furnaces which can be individually taken out of operation for reconditioning or they can be operated at between 50-110% of design capacity. The olefin-recovery section can operate continuously over long periods, a year or more, and at varying product output commensurate with the consumer demands.

Operating emergencies . . . Thus the



ETHYLENE RECOVERY integrated with refrigeration and storage facilities. Fig. 4.

necessity for olefin storage arises only from certain operating contingencies. They are:

1. In the case of an **emergency shutdown** of the olefin producing plant, the ethylene in storage offers sufficient feed stock for the orderly shutdown of the dependent synthesis units or their placement on static or recirculating operation if the interruption of the olefin production is only of short duration.

2. In case of **operational upsets** causing the olefin stream to be temporarily off-specification, the stream can be directed into a receiving tank for rerunning through the purification and fractionating sections while the synthesis plants draw feed from accumulated product storage which has been tested for its quality.

Limited storage . . . The ethylene storage capacity meeting the above situations of operating emergencies or contingencies is in the order of 4-6 hours' production providing at least two separate tanks in order to conveniently cope with situation (2) where the product is temporarily off-specification. Such limited intermediate storage facilities are generally provided within the ethylene fractionation or refrigeration system. Fig. 3 illustrates such an arrangement.

Accumulation system . . . The ethylene storage, or rather accumulation, is provided in conjunction with the reflux circuit of the ethylene fractionator. The reflux condenser produces some liquid in excess of the reflux required for proper fractionation and this liquid is automatically transferred into storage tanks for accumulation and emergency use. The storage tanks are maintained at a slightly higher pressure than exists in the reflux drum and the product line conveying ethylene to the synthesis units in vapor state. In case of operational upsets, ethylene is withdrawn from these tanks, vaporized, and automatically passed into the product transfer line.

Accumulation capacity . . . Assuming that, normally, ethylene is produced and consumed at the rate of 200,000

Table 1–Storage Facilities in Use

Material stored—	Temp. (°F.)	Pressure (psig.)	Type of storage
Natural gas (liquid)	—255	3	Insul. sphere
Natural gas (liquid)	—260	Atm.	Insul. cylindrical tank
Natural gas (gas)	100	80	Sphere
Natural gas (gas)	100	Atm.	Gas holder
Natural gas (gas)	60	2,240	Pipe bottles
Natural gas (gas)	60	750	Depleted oil or gas fields
Ethylene (liquid)	—40	203	Horizontal cylindrical tank
Ethylene (gas)	60	1,500	Dissol. cavern (salt beds)
Propane (LPG)	100	185-225	Horizontal cylindrical tank
Propane-ethane (pyrolysis feed)	100	300-350	Horizontal cylindrical tank
Propane (LPG)	60	90+	Dissol. cavern (salt beds)
Propane (LPG)	60	90+	Mined caverns (rock formation)
Butane	100	50	Sphere
Natural gasoline	100	10	Spheroid
Natural gasoline or distillate	80	10	Abandoned mine or exist. cavern (conditioned)

Notes: (1) Cost shown is for complete plant including compression and/or send-out facilities as required. (2) Applicable where compression and send-out facilities are not provided or required. (3) Cost is nil for depleted fields favorably located which are

"Ethylene storage lends flexibility to process unit operation."

TABLE 2—MATERIALS FOR STORAGE TANKS IN LOW TEMPERATURE SERVICE

Lowest service temp., °F.	ASTM specification: Low temperature classification	ASTM specification: Material grade or designation	Type of steel
—50	A300, Class 1	A212 Firebox	Specially treated carbon-silicon fine-grain steel
—75	A300, Class 2	A203, Grade A, Firebox	2½% nickel alloy steel
—150	A300, Class 3	A203, Grade D, Firebox	3½% nickel alloy steel
Below —150	Not required	A240, Grade S	Type 304 stainless steel

lb. per stream day, the accumulation of 5 hours' normal product flow, i.e., approximately 42,000 lb. or 1,160 gal., can be provided by two 6-ft. 6-in. diameter by 30-ft.-long tanks when allowing for approximately 75 to 80% volumetric use of these storage vessels. These storage tanks are usually located in close proximity to the process unit and can be provided at a minimum of additional plant cost.

What is the cost? . . . An ethylene plant producing 200,000 lb. of ethylene per operating day from a light hydrocarbon, ethane or propane, feed stock, would involve today an installation cost of approximately $4,750,000 and the storage facilities illustrated in Fig. 3 and described above, when provided in the initial installation, would add approximately $60,000 or 1.25% to the initial plant cost. This is, indeed, a low price to pay for the greater operating convenience, time efficiency, and production of chemicals resulting from such storage provisions.

Low-pressure operation . . . There are several ways of operating the final ethylene fractionating column[13] and the method chosen generally depends on the product specifications. If a high-purity ethylene, in excess of 99%, is desired, it may be advantageous to operate the fractionator at a lower pressure, in the order of 75 psia., using vapor compression on the tower overhead integrated with the ethylene refrigeration system. Such an arrangement, including the product storage provisions, is shown on Fig. 4. The cost of a plant employing low-pressure fractionation for the final product recovery step is not a great deal different from the more conventional process illustrated on Fig. 3 and the supplementary cost of equipment for the limited storage facility is approximately of the same order, as can readily be seen by comparing the two flow diagrams.

The ethylene product is delivered to the synthesis units in vapor state and at an elevated pressure up to 350 psig. Of course, a higher pressure can readily be maintained in this supply header, but the recovery of refrigeration will be less and may not be conveniently achieved within the ethylene-recovery plant. Again, it should be emphasized that the ethylene-storage provisions, although of limited capacity, lend valuable flexibility to the operation of the process units and the plant as a whole.

and Their Installation Cost

Storage capacity per unit: M.s.c.f.	Storage capacity per unit: Bbl.	Installation cost in dollars: Per cu. ft. of actual volume	Installation cost in dollars: Per unit of holding capacity: M.s.c.f.	Per unit of holding capacity: Lb.	Per unit of holding capacity: Bbl.	Notes
90,000	42,500	9.00-14.00	16-25	0.33-0.53	.....	1
65,000	31,500					
3,000 and over	.....	1.80-2.40	300-400	6.30-8.40	.....	2
500	.....	0.51-0.63	510-630	10.50-13.30	.....	1
75,000	.....	75.00-86.00	325-375	6.80-7.90	.....	1
25,000 and over	.....	Nil-0.065	Nil-1.23	Nil-0.026	.....	1; 3
2,700	1,500	7.00-11.00	23-32	0.32-0.43	.....	1
170,000	.....	0.36-0.71	1.10-2.25	0.016-0.031	.....	1
.....	1,500	2.50-3.00	.....	0.078-0.093	15.00-18.00	..
.....	1,500	2.75-3.30	.....	0.10-0.12	16.50-20.00	..
.....	Over 100,000	0.14-0.35	.....	0.0045-0.011	0.80-2.00	..
.....	Over 200,000	0.534-1.42	.....	0.017-0.044	3.00-8.00	..
.....	Over 15,000	1.40-1.60	.....	0.038-0.044	8.00-9.00	4
.....	Over 20,000	0.68-0.81	.....	0.017-0.020	3.80-4.60	5
.....	Over 100,000	0.09-0.18	.....	0.002-0.004	0.50-1.00	..

already connected into a distribution system. (4) Sphere would normally have 75 psig. design pressure. (5) Spheroid would normally have 15 psig. design pressure.

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Engineering know-how pays off as

Rich-gas drive yields high recovery

Humble engineers are getting low residual oil in Seeligson enriched-gas-drive flood

HERE is an engineering report on Humble Oil & Refining Co.'s enriched-gas-drive-recovery experiment in Zone 20B-07, Seeligson field, Texas, originally announced in The Oil and Gas Journal, July 14, 1958.

Theory . . . Laboratory studies have indicated that the displacement of oil from a reservoir by means of an enriched-gas drive results in extremely high oil recovery which, under the most favorable circumstances, will approach 100% in a swept area. Studies were made of a number of rich-gas-displacement experiments, all using horizontal sandpacked tubes as a reservoir. The results indicate that the more soluble the gas is in the displaced oil, the more efficient the gas is as a displacing fluid.

Information for this article was obtained from "Application for Experimental Allowable, Enriched Gas Drive Project, Seeligson (Zone 20B-07) Field." This application was submitted to the Railroad Commission of Texas by the Humble Oil & Refining Co.

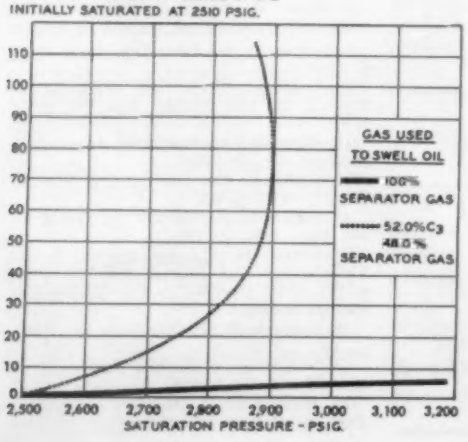
As rich gas dissolves in formation oil, swelling occurs, permitting a ready evaluation of the susceptibility of a crude to displacement by a certain gas simply by combining the two under pressure and measuring the volume obtained. Fig. 1 shows the swelling obtained by combining Seeligson reservoir oil initially saturated at 2,510 psi. with a gas composed of 52% propane and 43% separator gas.

The swelling obtained by dissolving 100% separator gas in the same reservoir oil is also shown for comparison purposes. Fig. 2 shows the per cent recovery obtained in the laboratory by displacing oil with gas of three different compositions. It will be noted that a gas composed of 50% propane and 50% separator gas yielded the maximum recovery.

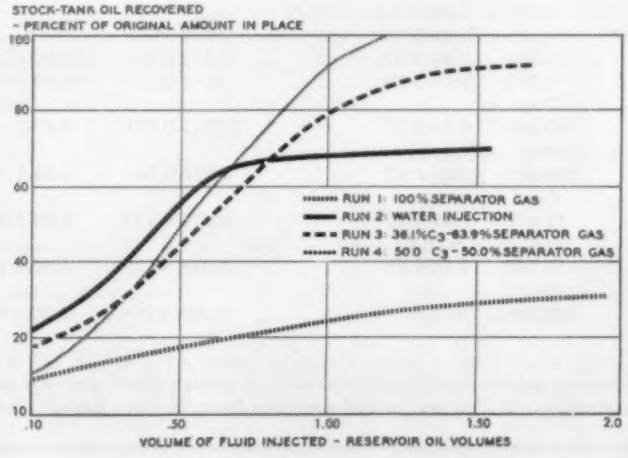
Reservoir selection . . . Based on the type of data indicated in Figs. 1 and 2, it was decided that the initial field application of the process at Seeligson should involve the injection of a rich gas composed of approximately 50% propane and 50% separator gas. It was also apparent that although the sand-packed tube experiments indicated that this drive mechanism would be highly successful in increasing the recovery from a petroleum reservoir, it was definitely necessary to carry on a field experiment to further evaluate (1) recovery under actual operating conditions, (2) the effect of gravity segregation, (3) the effect of the varying permeability profile found in most producing reservoirs, (4) the tendency of the injected gas to finger or cone due to reservoir pressure gradients, and (5) the pattern efficiency that could be expected.

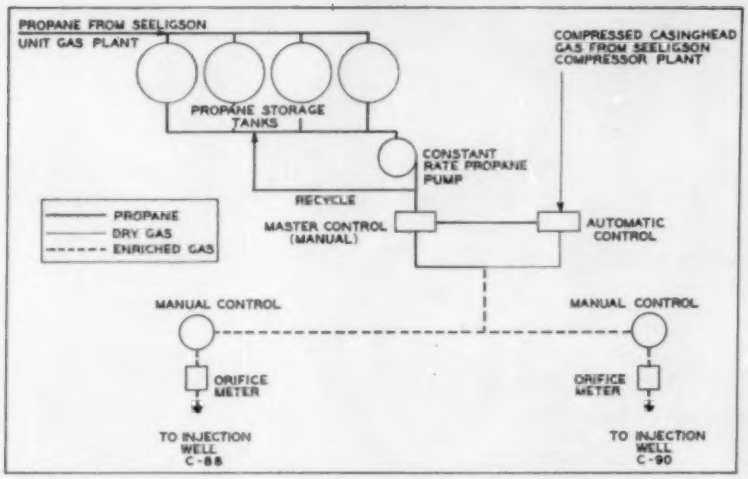
Seeligson Zone 20B-07 was selected for an experimental field evaluation of the enriched-gas drive because (1) the size of the reservoir would permit early evaluation of the process, (2) good geologic data were available, (3) the sand was uniformly developed,

LAB TESTS show that propane-rich gas caused Seeligson oil to swell more than separator gas, which means greater recoveries from rich-gas injection. Fig. 1.



CORE-TEST RESULTS, showing high oil recoveries when injected fluid is propane-rich gas. Fig. 2.



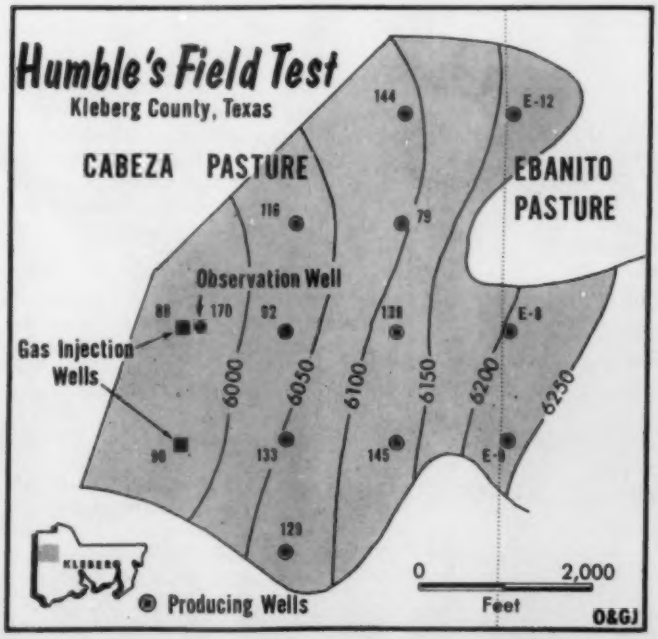


FLOW DIAGRAM of enriched-gas-mixing and injection system. Fig. 3.

(4) the reservoir was completely developed, (5) the recovery expected under the primary drive mechanism (solution gas) was low, (6) the reservoir was in the flush production stage and there was an absence of high gas saturations in the oil zone, and (7) the reservoir was 100% Humble operated and there was only one royalty owner involved.

At a hearing on July 31, 1956, Humble requested the Railroad Commission approval to conduct an experimental enriched-gas-drive project in the reservoir with injection in one or more structurally high wells. Approval to initiate the project was received on August 20, 1956, by special order No. 4-34,311.

Prior to the initiation of injection, it was necessary to complete the injection wells, install injection facilities, and contract for the purchase of propane from Magnolia's Seeligson plant since Humble did not have a propane source in the area. The injection facilities are shown schematically on Fig. 3 and have been designed to provide the ultimate in control of both composition and volume of the injected enriched gas. Actual injection was initiated on March 19, 1957, through wells K. R. Seeligson C-88T and C-90T.



MAP OF ZONE 20B-07, showing the locations of the injection wells and the observation well from which evaluation data were obtained. Fig. 4.

Geology and reservoir characteristics . . . Seeligson Zone 20B-07 field is a monoclinal, lenticular sand development on the eastern flank of the structure. As indicated in Fig. 4, it is bounded on the west by sealing faults and to the north and south by strand lines. An oil-water contact was never definitely proved downstructure to the east, but the thinning section and reservoir performance indicate that the sand pinches out in this direction and is not in communication with an aquifer.

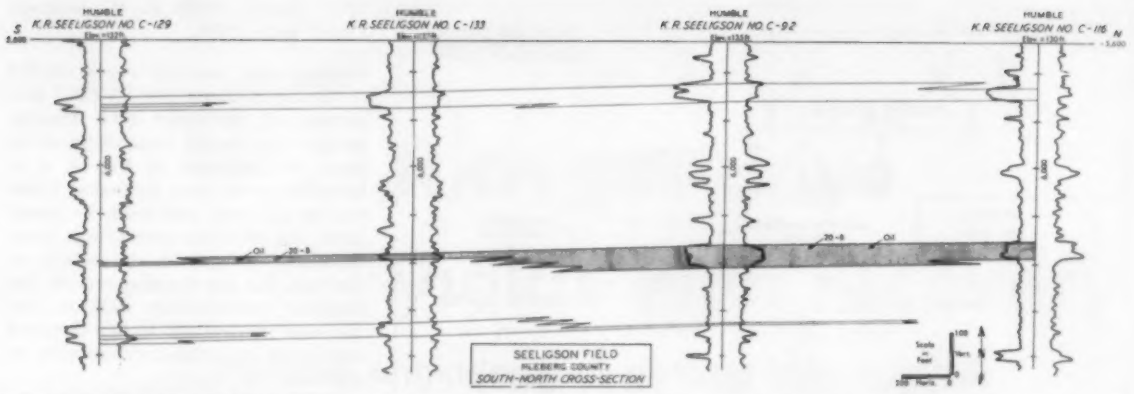
Drilling did not actually prove the presence of a gas cap; however, production data indicate that an extremely small gas cap was present originally, or was formed during the early producing life of the reservoir. The north-south and east-west cross-sections, Figs. 5 and 6, give further indication of the structure involved and the depositional characteristics of the sand.

As indicated in Fig. 7, the reservoir is 100% Humble operated and completely underlies the King Ranch lease. There are currently 12 producing wells and 2 injection wells completed in the reservoir. One well produces with a high gas-oil ratio, but no wells produce water. The physical properties of the rock, characteristics of the reservoir fluid, and other pertinent data are shown in Table 1.

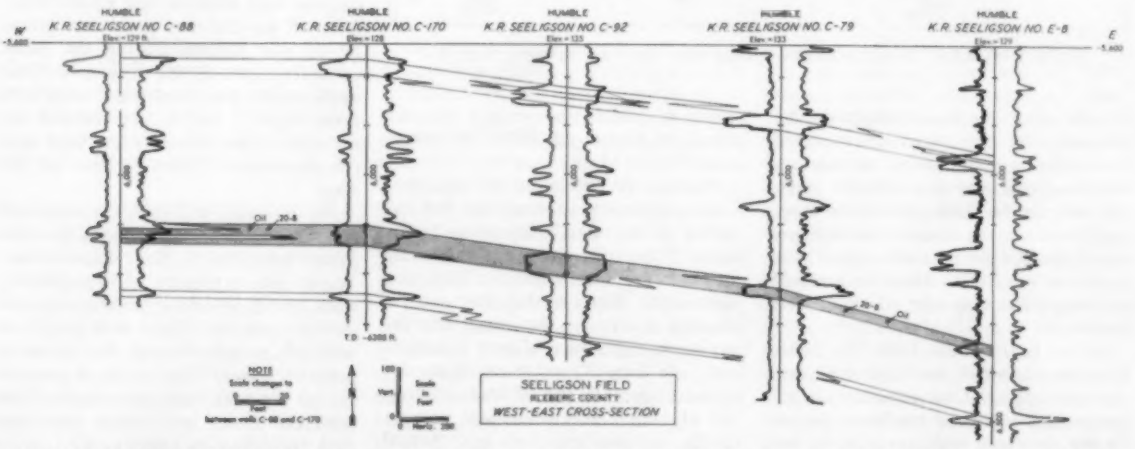
Progress of field experiment . . . Production data for Zone 20B-07, shown in Fig. 8, show that prior to the initiation of gas injection in March 1957, the reservoir pressure was declining rapidly and the average gas-oil ratio was increasing. This performance indicates that the primary mechanism was essentially solution-gas drive. After injection started the average reservoir pressure increased from approximately 2,360 psi. to 2,660 psi. as of April 1, 1958. The pressure has increased uniformly throughout all areas of the reservoir. In addition, the average reservoir gas-oil ratio decreased noticeably due to the redissolving of free gas in the oil column because of the pressure increase and the creation of an oil bank resulting from the displacement process.

Potential test . . . Immediately prior to the initiation of injection in the subject reservoir, K. R. Seeligson C-88T, the proposed injection well, was potentialed for the purpose of transferring its allowable to downstructure wells.

The well produced 122 bbl. of 44°-API-gravity oil with a gas-oil ratio of



SOUTH-NORTH CROSS-SECTION shows the thinning tendency of Zone 20B-07 in the southern part of the field. Fig. 5.

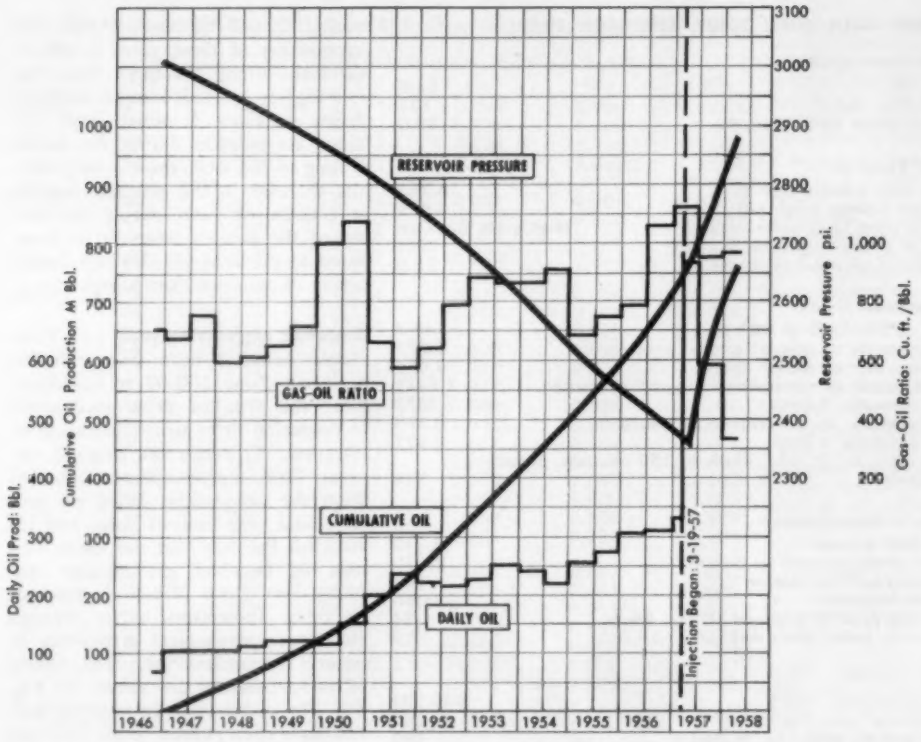


WEST-EAST CROSS-SECTION indicates some of the geologic variation in the 20B-07 zone. Note the change in horizontal scale between the injection and observation wells. Fig. 6.

LEASE MAP of a portion of Seeligson field, showing the location of the 20B-07 reservoir. Fig. 7.

12,197 cu. ft. per bbl. This proved the presence of a significant oil saturation in the reservoir immediately adjacent to the well bore.

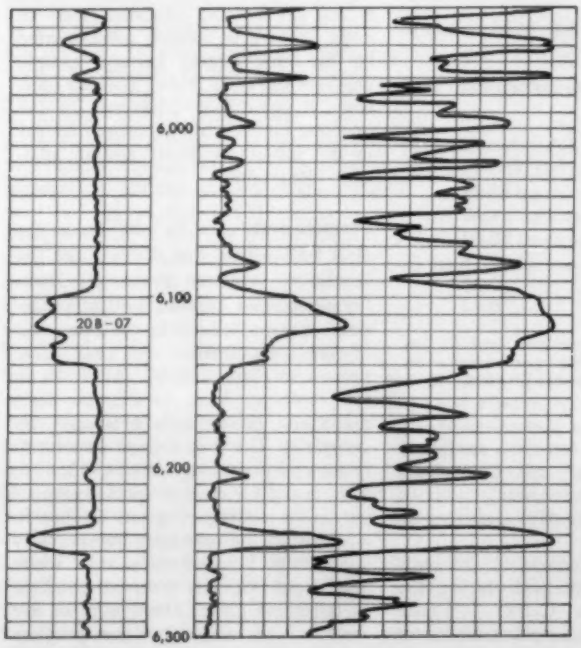
Test well drilled . . . To determine whether or not the enriched-gas-drive process was resulting in the recovery of a significant quantity of oil in the swept area of the reservoir, a core test well (K. R. Seeligson C-170) was drilled in December 1957. As indicated in Fig. 4, the surface location of this well was 100 ft. east of the injection well C-88 but it topped the sand at a datum of 6,100 ft., 120 ft. east of the injection well. Although C-170 is currently completed in zones 19C-08 and 20-E, the location was selected and the drilling accomplished primarily to evaluate the injection project in zone 20B-07. A pictorial representation of the electric log for this well is shown in Fig. 9 and on the cross-section in Fig. 6. Conventional cores were obtained in zones 13A, 13C, 14B, 19C-08, 20B-07, and 20-E during the drilling of this well. Core analysis showed that the sand section in C-170, which is slight-

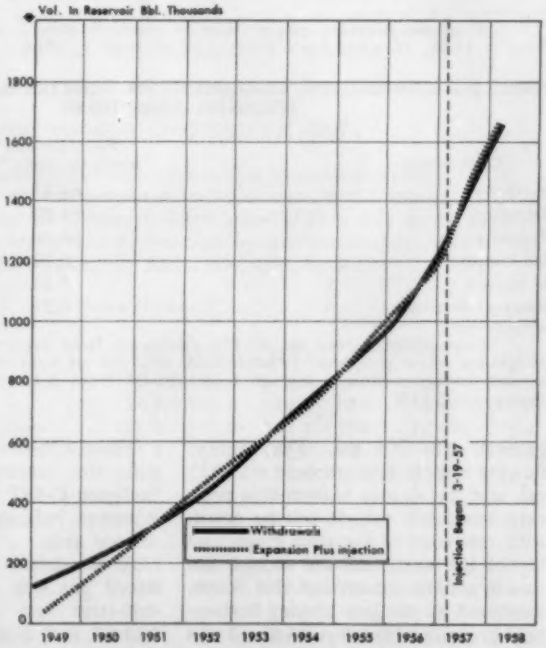

RESERVOIR PRESSURE
GAS-OIL RATIO
CUMULATIVE OIL
DAILY OIL
Injection Began: 3-19-57
Daily Oil Prod: Bbl.
Cumulative Oil Production M Bbl.
Reservoir Pressure psi.
Gas-Oil Ratio: Cu. ft./Bbl.
1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958

PRESSURE-PRODUCTION history of the 208-07 reservoir. Note the rapid increase in reservoir pressure after injection was started. Fig. 8.

ly downstructure from C-88, was almost completely swept of oil in areas of reasonable permeability (close to 0% saturation) and that the tight sections of sand had extremely low residual saturation.

Two drill-stem tests were run in the reservoir section of Seeligson C-170. The first test was from 6,102 to 6,120 ft. with ¼-in. bottom and 1-in. surface chokes. The tool remained open more than 1 hour. The well flowed gas with a maximum surface pressure of 920 psi. The average flowing bottom-hole pressure was 2,327 psi. and the shut-in bottom-hole pressure was 2,736 psi. No oil was recovered on this test. The second test was from 6,137 ft. with ¼-in. bottom and 1-in. top chokes. The tool remained open 71 minutes. The maximum surface




Vol. In Reservoir Bbl. Thousands
Withdrawals
Expansion Plus injection
Injection Began 3-19-57
1949 1950 1951 1952 1953 1954 1955 1956 1957 1958

TYPICAL ELECTRIC LOG (left) of a 208-07 well, Fig. 9. **VOLUMETRIC BALANCE CALCULATIONS** (right) showed that the withdrawal rate was matched by the rate of injection plus the expansion of the oil. These results also indicated that the injected gas was being confined to the 208-07 reservoir Fig. 10.

TABLE 1—MER DATA ZONE 20B07, SEELIGSON FIELD

1. Physical Properties of Reservoir Rock	
(a) Average porosity, %	24.0
(b) Average permeability, md.	133
(c) Average interstitial water saturation, %	30.0
2. Structural Features of Reservoir	
(a) Oil-water contact, feet subsea (low oil)	6,263
Gas-oil contact, feet subsea (high oil)	5,975
(b) Ratio of gas-cap volume to oil-zone volume	Negligible Gas Cap
(c) Approximate dip of producing zone, ft./mile	373
(d) Approximate average oil sand thickness, ft.	15.0
3. Characteristics of Reservoir Fluids	
(a) Average gravity of oil, °API at 60° F.	40.4
Average specific gravity of gas at atmos. press.	0.797
(b) Saturation pressure, psi. at datum	3,010
Formation volume factor at saturation (original) pressure	1.4442
At intermediate pressure (2,000)	1.3073
Viscosity of reservoir oil, cp. at original pressure	0.370
At intermediate pressure (2,000)	0.421
Dissolved gas-oil ratio, cu. ft./bbl., flash at 150 psi. sep. press. at original pressure	744
4. Reservoir Pressures and Temperatures	
Pressure datum, feet subsea	6,110
(a) Original reservoir pressure, psi. at datum	3,010
Reservoir temperature, °F at datum	183
(b) Reservoir pressure history*	Graph
(c) Average shut-in time prior to pressure survey, hours	24
(d) Average productivity index, bbl./day/psi.	2.0
5. Statistical Data	
(a) Cumulative oil production, bbl.†	978,233
Current oil production rate, bbl./day‡	384
(b) Current average gas-oil ratio, cu. ft./bbl.‡	999
(c) Current water production (per cent of liquids)‡	0
(d) Number of producing wells§	12
Number of limited-capacity wells	1
Number of high gas-oil ratio wells	1
Number of salt-water producing wells	0
(e) Approximate developed acreage	565
Stage of development	Developed
(f) Developed acreage per well	47
(g) Current volume of gas flared, M.c.f./day	0
(h) Volume of gas injected, M.c.f.†	1,227,000
(i) Approximate stage of depletion of reservoir	Flush

*Includes pressure and production trends to May 1, 1958. †Cumulative to May 1, 1958. ‡During April 1958. §As of June 1, 1958.

TABLE 2 — COMPOSITION COMPARISON OF INJECTED AND PRODUCED GAS SEELIGSON ZONE 20B-07

Component—	Injection gas* Analysis, mole %	Subsurface sample† Analysis, mole %
Methane	44.47	43.99
Ethane	4.20	4.10
Propane	50.40	50.89
Iso-butane	0.38	0.18
N-butane	0.26	0.20
Heavier fraction	0.29	0.64

*Composition based on 48.9% Seeligson field separator gas and 51.1% Magnolia plant propane. †Podbielniak analysis of subsurface gas sample obtained during drill-stem test of Zone 20B-07 from 6,128 to 6,137 ft. in K. R. Seeligson C-170.

pressure was 200 psi. The average flowing bottom-hole pressure was 825 psi. and the shut-in bottom-hole pressure was 2,668 psi. It will be noted, with reference to the core graph and log of the well, that the second test was in a tight section and this is substantiated by the low flowing bottom-hole pressure. Once again, no oil was recovered with only 75 ft. of muddy water being obtained in the drill pipe when the tool was pulled.

These drill-stem-test data, combined with the potential test data from Seeligson C-88T immediately prior to injection, indicate a high recovery in the test area.

A subsurface sample of the produced gas was obtained during the drill-stem test in C-170 of zone 20B-07 and a laboratory analysis of this sample is recorded on Table 2 which shows a comparison of the injected and produced gas for the reservoir. It will be noticed that the composition of these gases is almost identical. Along the same lines, the mud-logging gas unit sample analyses, shown in Table 3, which were obtained on location during the actual drilling of the well, show a very definite increase in the propane content of constituent gases during the coring of the subject reservoir as compared to the analyses obtained during coring of adjacent formations.

Reservoir engineering study . . . Volumetric balances have been run for Seeligson Zone 20B-07 to (1) determine the type of drive mechanism in operation prior to the initiation of injection, (2) verify the original reservoir fluid in place volumes obtained from the calculations based on geologic and core-analysis data; and (3) establish the fact that the entire volume of enriched gas injected was going into Zone 20B-07 instead of to other formations either through subsurface mechanical difficulties or natural communication. The results of these balances are shown on Fig. 10. The withdrawals in reservoir barrels have been plotted versus time and are indicated by the solid line on the figure whereas expansions plus injection in reservoir barrels are indicated by the dashed line. It will be noted that these two curves essentially coincide which indicates that Zone 20B-07 has operated in the past and is currently operating as a closed system. The fact that the injected enriched gas is being confined solely to Zone 20B-07 is further substantiated by the mud-logging gas-unit sample analyses shown in Table 3 which indicates a significant difference in the propane content of the formation gas in the subject reservoir and in adjacent formations.

Periodic tests . . . In addition to the core well which was drilled, and the laboratory analyses previously mentioned, certain routine control procedures are carried on in the operation of the experimental rich gas drive project in Zone 20B-07. All wells in the reservoir have production tests made and bottom-hole pressures run quarterly. The four highest structurally located producing wells, C-92, 116, 129, and 133, receive special emphasis in the testing program in that in addition to the quarterly survey, they have monthly production tests made and separator gas samples obtained at the same time. These samples are analyzed to determine the propane content of the separator gas which is a very reliable indicator as to the amount of enriched oil or injected gas

TABLE 3—MUD-LOGGING-UNIT GAS-SAMPLE ANALYSES K. R. SEELIGSON C-170

Zone	Depth	Constituent gases, mole per cent*				
		C_1	C_2	C_3	iC_4	nC_4
19B-03	5,920	0.526	0.031	0.019	0.005	0.006
	24	1.403	0.073	0.029	0.008	0.008
	31	6.750	0.317	0.132	0.034	0.037
	33	8.008	0.372	0.132	0.033	0.036
19C-08	5,940	0.473	0.024	0.021	0.004	0.006
	44	0.862	0.050	0.037	0.010	0.009
	46	1.251	0.080	0.068	0.018	0.021
	48	1.269	0.082	0.072	0.020	0.020
20B-07	6,095	0.610	0.014	0.381	0.000	0.000
	96	1.048	0.111	0.701	0.000	0.000
	97	1.112	0.083	0.621	0.000	0.004
	98	0.627	0.061	0.305	0.000	0.000
	6,101	0.752	0.070	0.763	0.003	0.003
	03	1.635	0.138	1.367	0.005	0.004
	05	2.468	0.195	1.786	0.006	0.010
	07	2.667	0.190	1.546	0.006	0.008
	09	2.542	0.193	1.617	0.007	0.006
	14	3.684	0.278	2.887	0.011	0.007
	16	1.746	0.182	2.153	0.008	0.007
	18	4.219	0.320	3.088	0.009	0.007
	19	2.871	0.217	1,920	0.005	0.003
	24	1.499	0.116	1.089	0.003	0.004
20-E	6,238	0.409	0.018	0.014	0.002	0.003
	39	0.682	0.034	0.021	0.002	0.003
	41	0.704	0.048	0.021	0.003	0.004
	43	0.317	0.009	0.015	0.002	0.002
	45	0.354	0.018	0.012	0.003	0.002
	46	0.327	0.000	0.012	0.003	0.003
	47	0.388	0.023	0.016	0.003	0.003

*Gases extracted from mud stream with analyses by chromatograph.

in the produced stream from these wells.

Summary . . . A maximum of control is being exerted continually to assure that the experimental enriched-gas-drive project being carried on in Zone 20B-07 in Seeligson field will provide all the necessary information to permit a thorough evaluation of the process. To date, the results have been encouraging in that it has been determined that significant recovery is possible in the swept area; however, further evaluation is necessary to establish (1) the effect of gravity segregation, (2) the pattern efficiency that can be expected, (3) the conformance that will occur in the swept area, (4) the volume of enriched gas to accomplish maximum recovery. Until these factors are evaluated, it will not be possible to determine the feasibility of the widespread application of this process to petroleum reservoirs.

It appears that as in any type of experiment, it is necessary to have the best possible control of all variables before reliable results can be obtained. Therefore, the early evaluation of the enriched-gas drive in Zone 20B-07 in Seeligson field, in which optimum control is exercised, presents an excellent opportunity for the oil industry to obtain information which might greatly change the expectations for the domestic production of petroleum.

BOOKS

ADVANCES IN CHEMICAL ENGINEERING. Volume 2. Edited by Thomas B. Drew and John W. Hoops, Jr. Published by The Academic Press, Inc., 111 Fifth Avenue, Uew York 3. 338 p. $9.50.

The authors' stated purpose for this book is to provide the chemical engineer with critical summaries of recent work—some that bring standard copies up-to-date, some that gather and examine the results of newly utilized techniques, and some that survey the needs and possibilities of newly important segments of the industry.

Each author has endeavored to provide a critical analysis rather than an annotated bibliography, and to address those engineers currently active in many fields rather than the narrow specialist.

Section 1 deals with boiling of liquids. Section 2 is devoted to automatic process control. A third section covers treatment and disposal of waste in nuclear technology. The authors discuss high vacuum technology in Section 4. Sections 5 and 6 cover separation by adsorption methods and mixing of solids respectively.

SUCCESSFUL PROCESS PLANT PRACTICE. By Robert L. Davidson. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36. 302 pp. $10.

This is a reference book of how-to-do-it items, originally published in Petroleum Processing magazine.

The book is arranged under the main headings of: managing the job (personnel training, safety programs, schedules and records); maintenance (heaters, heat exchangers, towers, supporting equipment, etc.); handling processes and products (process controls, sampling, etc.); and protecting equipment (linings and shields, testing and inspecting.).

1957 STRUCTURE MAPS OF TEXAS OIL FIELDS. Published by Rinehart Oil News Co., Box 1208, Dallas 22, Tex.

A large number of structure maps as submitted during 1957 to the Texas Railroad Commission by operators for rulings on field discoveries, injection projects, and Rule 37 permits are assembled in this new publication.

The maps are arranged by Railroad Commission districts.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

NELSON REFINERY CONSTRUCTION INDEX

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained October 1, 1956 (page 110) as well as the Indexes of Individual Items of Equipment that appear on the Costimating page in the first issue of the months of January, April, July, and October.

	Index (1946=100)					
	1950	1954	1955	1956	1957	April 1958
Pumps, compressors, etc.	138.2	166.5	172.2	192.0	206.7	213.6
Electrical machinery	134.9	160.0	162.5	175.0	188.9	192.3
Internal-combustion engines	126.0	150.5	153.2	164.0	173.9	178.4
Instruments	127.8	154.6	162.9	182.1	187.4	193.5
Heat exchangers	140.0	171.7	156.8	190.7	203.6	188.4
Misc. equipment average	*126.2	160.7	161.5	180.5	192.1	193.2
Materials component	149.5	174.6	176.1	190.4	201.9	202.5
Labor component	144.0	183.3	189.6	198.2	208.6	216.6
Nelson construction index	146.2	179.8	184.2	195.3	205.9	211.0

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

Sample trap collects air or gas-drilled samples

The main reasons for failure to sample log many wells drilled with an air or gas media are:

1. **Lack of an available, workable mechanical trap for collecting representative samples.**
2. **The assumption that air or gas-drilled particles are too small for making a worth-while lithologic description.**

BY KERBY E. LaPRADE
Phillips Petroleum Co.

THE "BABY-GIANT" sample trap shown in the scaled drawings has been used successfully in collecting representative samples while drilling with gas. It will work equally well when drilling with air.

Sampling problems . . . The assumption that air or gas-drilled particles are too small for a worth-while description is only partly true. Description of individual textures and structures of the small particles is difficult under the low-power lens of the binocular microscope. The high-power lens, however, permits a fairly accurate description of these features.

When describing air or gas-drilled samples, the geologist should be aware that some of the textures of the individual sediment such as size, roundness, frosting, pitting, and polishing, as well as some of the structures of aggregate sediments such as bedding, fracturing, and fossils may have been altered or destroyed by the processes of attrition and impact during transportation from in situ position to the surface.

These processes of attrition and impact are especially active on air or gas-drilled particles because of the high velocity and turbulence of the transporting agent in the absence of the cushioning effect of fluids.

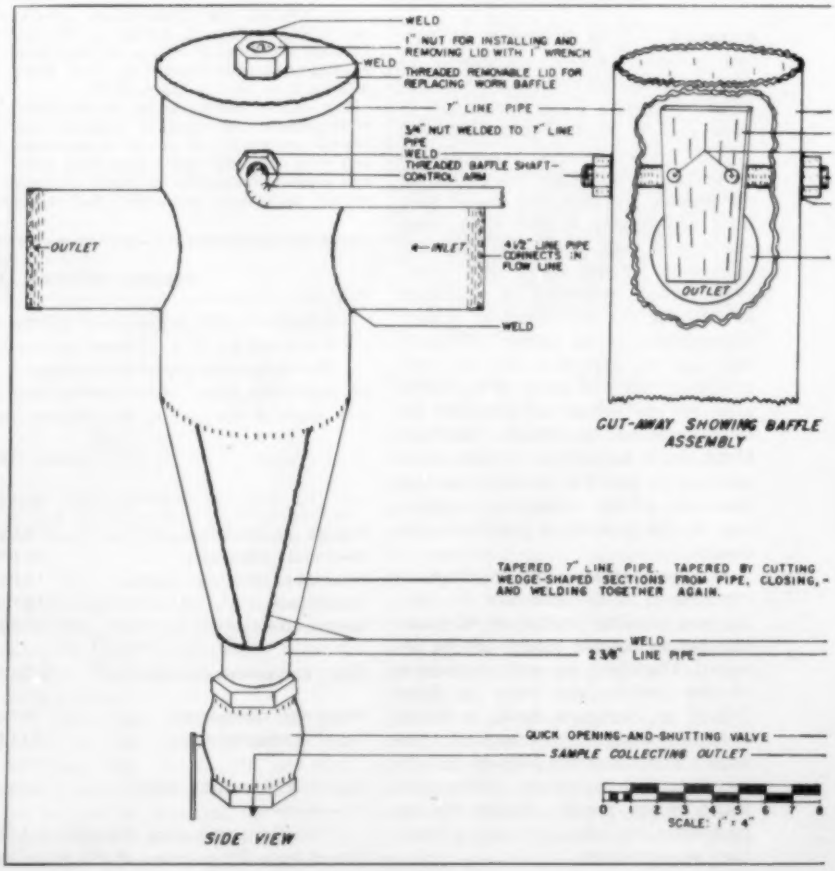
Under such conditions, only the recognizable in situ textures and structures should be described, as the amount of alteration and destruction may be highly variable.

Most attempts to collect air or gas-drilled samples involve some sort of mechanical trap attached to the end of the exhaust flow line. Many of these traps prove defective in mechanical operation, resulting in failure to collect samples efficiently and accurately. Further, the location of the traps at the end of the exhaust flow line is undesirable because of the hazardous conditions produced in the area by the vigorously discharging dust-laden air or duct-laden burning gas. These hazardous conditions make the act of taking samples from the traps both dangerous and uncomfortable.

Field success . . . The Baby-Giant sample trap has demonstrated that it can be relied on to function efficiently under actual drilling conditions. The trap is designed to fit into the exhaust flow line at any intermediate point from the drilling rig to the exhaust outlet, at a safe distance from the hazardous area mentioned above.

The experimental sample trap was designed and constructed by K. E. LaPrade, geologist; D. E. Jones, engineer; and C. R. Westwood, mechanic; all of Phillips Petroleum Co.

Materials used in constructing the trap were gathered from the scrap pile on a Phillips lease, Rangley, Colo. The same materials can usually be found on most drilling locations. A


WELD
1" NUT FOR INSTALLING AND REMOVING LID WITH 1" WRENCH
WELD
THREADED REMOVABLE LID FOR REPLACING WORN BAFFLE
7" LINE PIPE
3/4" NUT WELDED TO 7" LINE PIPE
WELD
THREADED BAFFLE SHAFT—CONTROL ARM
OUTLET
INLET
4 1/2" LINE PIPE CONNECTS IN FLOW LINE
WELD
OUTLET
CUT-AWAY SHOWING BAFFLE ASSEMBLY
TAPERED 7" LINE PIPE. TAPERED BY CUTTING WEDGE-SHAPED SECTIONS FROM PIPE, CLOSING, AND WELDING TOGETHER AGAIN.
WELD
2 3/8" LINE PIPE
QUICK OPENING-AND-SHUTTING VALVE
SAMPLE COLLECTING OUTLET
0 1 2 3 4 5 6 7 8
SCALE: 1" = 4"
SIDE VIEW

complete list of the materials with instructions for building the trap is given below.

The trap is simple in design and can be easily constructed in 3 to 4 hours, using a cutting and welding torch, ¾-in. SAE threading tap, drill with ¾-in. and ⅞-in. bits, and a small assortment of wrenches.

Case history . . . The trap was used during drilling of the Phillips 2 Canyon "B," 12-2s-104w, Rio Blanco County, Colorado, in June 1956. The trap was inserted about midway along a dual 4½-in. exhaust flow line to collect gas-drilled samples of the Mancos shale formation.

The trap was located at this point rather than at the exhaust outlet to avoid the hazardous conditions associated with the flaring of the discharging dust-laden gas.

The surface-exposed Wasatch-Green River formations and the underlying Mesaverde formation were drilled with mud because of their abundant water-bearing sandstones which prohibit drilling with an air or gas media. At the Mesaverde-Mancos shale formational contact, the hole was cased to shut off the water in the overlying water-bearing sandstones and an attempt was made to drill the Mancos shale with gas. Two hunderd and nine feet of the shale was drilled with gas before water was encountered in the Morapos(?) sandstone member, causing resumption of the use of mud for further drilling to a total depth of 7,913 ft. in the Entrada formation.

"Reports from geologists, drillers, tool pushers, and production supervisors who saw the trap in operation say that it surpasses any device or method they have seen for collecting air or gas-drilled samples."

Even though the trap was in use during drilling of only 209 ft. of Mancos shale, it proved that it will work effectively and efficiently for extended durations with minor repairs.

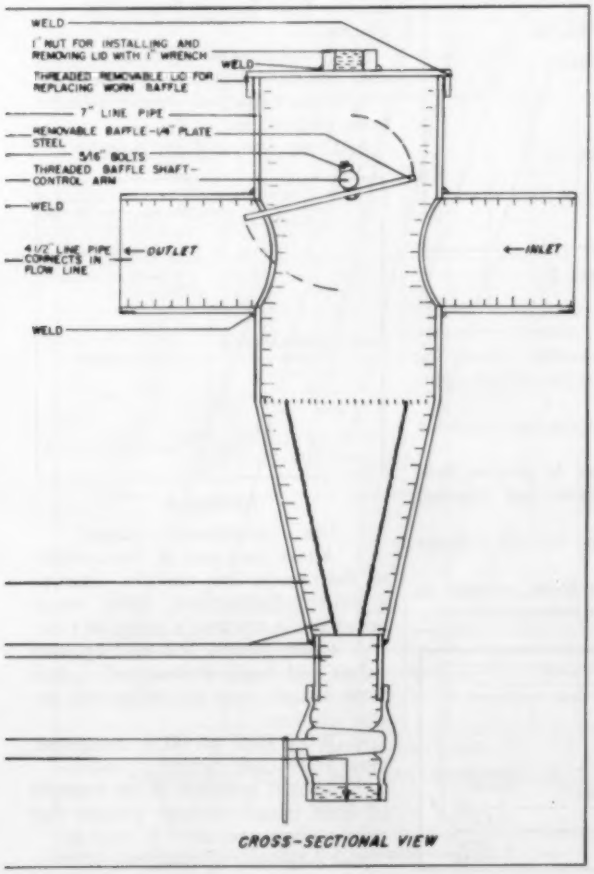
Reports from geologists, drillers, tool pushers, and production supervisors who saw the trap in operation say that it surpasses any devise or method they have seen for collecting air or gas-drilled samples.

Minor repairs to the trap will usually consist of periodic replacement of baffles worn away by abrasion produced by the blasting effect of samples entering the trap. Ultimately, internal abrasion of the barrel will make it necessary to replace the entire trap.

Because of the short time the trap was in use, it is not known how often either the baffle or trap will need replacement. It is thought that one baffle will be sufficient for drilling one well of average depth, while one trap will be adequate for drilling several wells of average depth. The cost involved in replacing a baffle or an entire trap is a few pennies or a few dollars, respectively.

The trap is easily operated by rotating the baffle with the control arm to the position needed to force incoming samples downward, and simultaneously opening the quick opening-and-shutting valve at the base of the trap.

The samples are forced out through the bottom of the trap at a rate determined by adjustments of both the baffle and valve, where they are collected in a bucket or box container for study. The procedure is repeated at 10-ft. intervals, or other intervals recommended by the geologist or engineer in charge.



CROSS-SECTIONAL VIEW

Building a sample trap

List of materials and how to assemble

1. 21¼-in. piece of 7-in. line pipe, threaded at one end, for making the barrel of the trap.
   Taper unthreaded end of the pipe from an i.d. of 6½ in. to an i.d. of about 2⅜ in. by cutting out four wedge-shaped sections, size 3.24 in. (base) by 9⅛ in. (length), leaving 2.26 in. of pipe between each wedge base. Measurements should be made with the wedge bases coinciding with the end of the pipe and along the outer circumference. Bend the remaining interwedge sections of pipe together and weld as shown in the scaled drawings. Bending of individual sections is facilitated by application of heat at desired points of yield.

2. 2½-in. piece of 2⅜-in. line pipe, threaded at one end, for making the sample-collecting outlet.
   Insert unthreaded end of the pipe about ¼-in. into the tapered opening of the barrel and weld as shown in the drawings.

3. 2⅜-in. quick-opening-and-shutting valve for regulating the sample-collecting outlet.
   Screw the valve tightly onto threaded end of the 2⅜-in. pipe as shown in the drawings.

4. Two 5¾-in. pieces of 4½-in. line pipe, each threaded at one end, for making the exhaust inlet and outlet.
   Shape unthreaded ends of each piece of pipe to allow them to fit perpendicularly with the outer circumference of the barrel. Cut out two opposing 4-in. holes from the barrel, centered on a diameter 6¾ in. from the untapered end. Center the shaped ends of the two 4½-in. pipes over each of the 4-in. holes in the barrel and weld as shown in the drawings.

5. 30-in. piece of ¾-in. steel rod and two ¾-in. SAE hex nuts for making the baffle control arm.

Make a sharp right-angle bend in the rod 10 in. from one end. Use the short 10-in. section for the baffle pivot and the long 20-in. section for the handle. Thread about 9½ in. of the pivot section with a ¾-in. SAE threading tap and screw one ¾-in. hex nut nearly all the way down the threads. Insert the pivot through two opposing ¾-in. holes drilled through the barrel, centered on a diameter 3⅜ in. from the untapered end, and aligned perpendicularly with the exhaust inlet and outlet. While holding the control arm in position, screw on the remaining ¾-in. hex nut and tighten until all slack is taken up in the pivot between the nuts. The nuts are now aligned and can be welded to the barrel. Rotate the control arm to the position shown in the side view of the trap and mark points to drill two $\frac{7}{16}$-in. holes in the pivot section for use in attaching the baffle as shown in the drawings. The two $\frac{7}{16}$-in. holes should be 2⅛ in. apart, with each $1\frac{1}{16}$ in. from the center of the barrel along the pivot section. Remove the control arm from the barrel by screwing through both welded hex nuts and drill the $\frac{7}{16}$-in. holes where marked. Screw control arm back into the barrel to the same position where the points wre marked for drilling the $\frac{7}{16}$-in. holes in the pivot.

6. Small piece of ¼-in. plate steel, size 3¼ by 6½-in., for making the baffle.

   Cut out the baffle, size 3¼ in. by 6½ in. by 2½ in., from the ¼-in. plate steel. Drill two $\frac{7}{16}$-in. holes in the baffle on a line drawn 2½ in. from and parallel with the widest end. The holes should be spaced 2⅛ in. apart along the line with each $1\frac{1}{16}$ in. to either side of the center point. These holes will coincide with those drilled in the pivot section of the control arm.

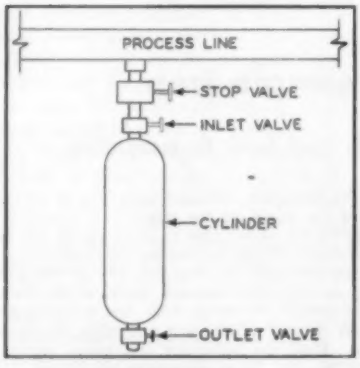
7. Two $\frac{7}{16}$ by 1½-in. bolts with nuts for attaching the baffle to the pivot section of the control arm.

   Attach the baffle as shown in the drawings by inserting the $\frac{7}{16}$ in. by 1½ in. bolts through coinciding $\frac{7}{16}$-in. holes in the baffle and pivot section of the control arm and tighten securely. Be sure that the baffle is mounted on the bottom side of the pivot so that it lies between the exhaust-inlet side of the trap and the pivot. With the baffle mounted in this fashion, the pivot is protected by the baffle from much of the abrasive effects of incoming samples.

8. 7-in. line pipe collar; small piece of ¼-in. plate steel, size 7½ by 7½ in.; and a 1-in. hex nut. These materials are used to make the lid of the trap.

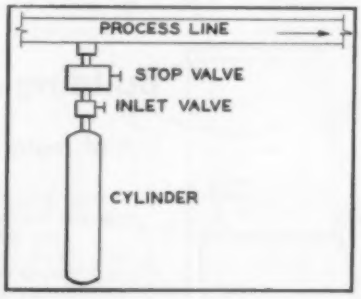
   Cut off about a ¾-in. section from the 7-in. line pipe collar, being careful not to damage the threads. Cut a round section from the ¼-in. plate steel with a diameter of 7½ in. Complete the lid by welding the 7½-in.-round section onto the ¾-in. section of the 7-in. pipe collar as shown in the drawings. Center and weld the 1-in. hex nut on top of the lid.

Here are four more ways to collect samples



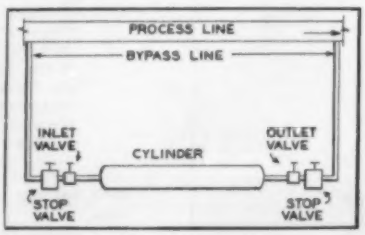
Method 1

1. Use a double-end cylinder with sufficient capacity and equip it with suitable valves.
2. Fill the cylinder with mercury or water so that all contaminates in cylinder are removed by displacement.
3. Attach cylinder to process line and open process-line stop valve.
4. Open both valves on sampling cylinder, the inlet valve wider than the outlet, and allow the process fluid to displace the mercury or water in cylinder.
5. When cylinder is fiiled, (this is indicated when process fluid begins flowing out cylinder outlet valve) close stop valve and then both inlet and outlet valves and remove cylinder from process line.
6. Transport cylinder to laboratory and bleedoff samples as required.



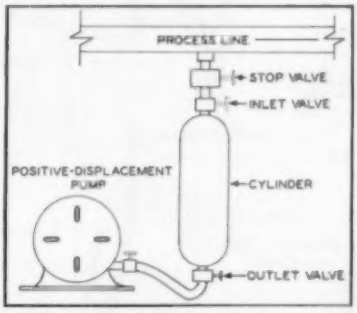
Method 2

1. Use either a double or single-end cylinder with valves, preferably packless type. Assembly should be helium-leak-tested to insure leak tightness.
2. Evacuate the cylinder to remove contaminates.
3. Attach cylinder to process line.
4. Open inlet valve and drawoff desired sample.
5. Close valve and remove cylinder from process line.
6. Draw samples from cylinder as required on mass spectrometer.



Method 3

1. Establish bypass line or parallel line to main process line with facilities to insert sampling cylinder.
2. Insert double-end cylinder in bypass line.
3. Open both inlet and outlet cylinder valves wide and allow process fluid to flow through bypass line and cylinder.
4. Permit flow to continue running until accurate sample is established.
5. Close valve and remove cylinder from process line.
6. Draw sample from cylinder.



Method 4

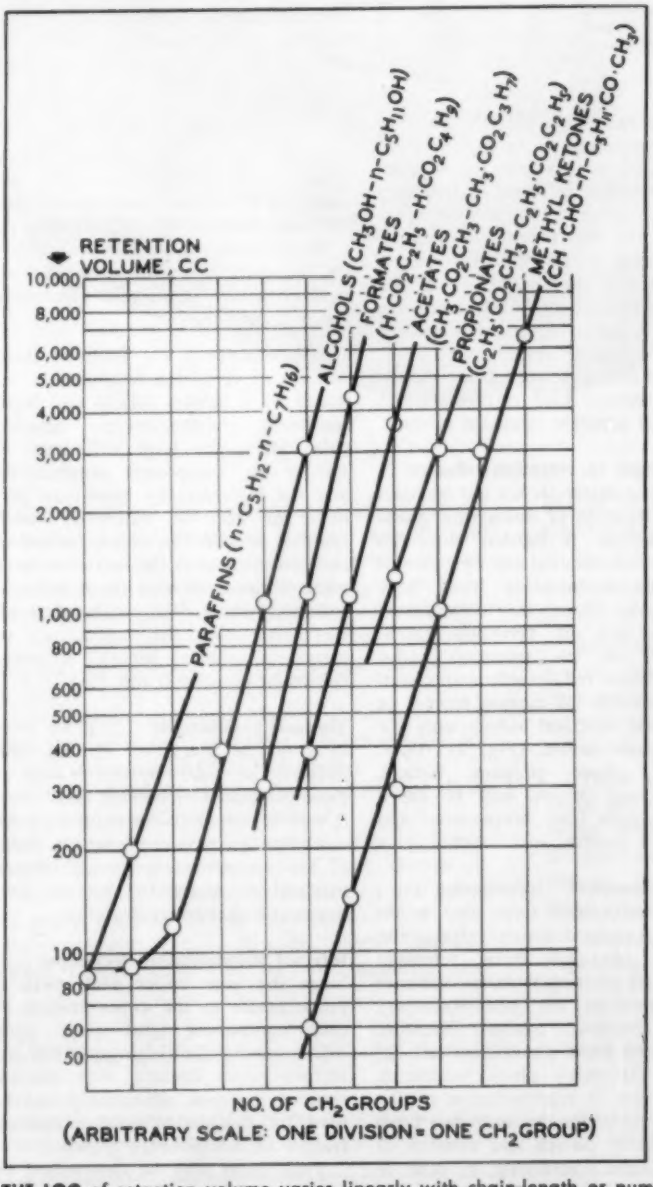
1. Use a double-end cylinder.
2. Attach one end of the cylinder to the process line and the other to a positive-displacement pump which draws uniformly over a period of time.
3. Open process line and cylinder valves and begin drawing off a uniform sample over an established period of time.
4. When time period is completed, close valves and remove cylinder.
5. Sample gathered is an example of fluid passed through process line over a given period.

Item contributed by Hoke, Inc.

Here are the limits in application for

Gas chromatography

BY H. H. HAUSDORFF AND N. BRENNER
Perkin-Elmer Corp.
Norwalk, Conn.



THE LOG of retention volume varies linearly with chain-length or number of identical substituents for homologous series. Fig. 1.

IN PRINCIPLE, vapor fractometry can be applied to the qualitative and quantitative analysis of any organic or inorganic material which can be readily converted into its vapor phase. The only limitation is, therefore, in boiling points of these materials.

At present, the method is practically limited to materials with boiling points up to approximately 400° C. This limit results from allowable temperatures which can be applied to the chosen column and to the speeds which would result for the higher boiling components in the mixture. Thus, most solids and high-boiling oils cannot be subjected to this technique.

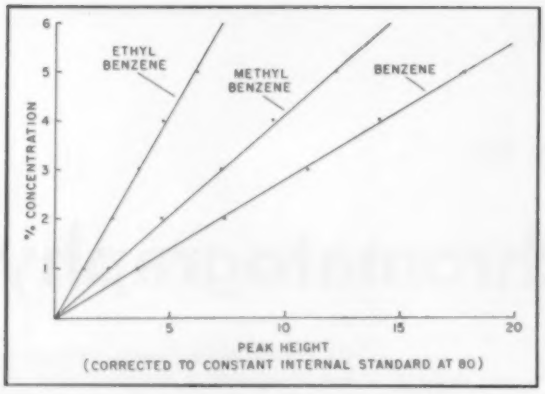
Overlapping components . . . These might create difficulties in some cases, but should never be considered as a limitation because of the great flexibility in the choice of the stationary phase and in view of the previously mentioned selectivity characteristics.

Instrument sensitivity . . . This is seldom limiting since minor constituents can be brought out in recordings by working with larger sample quantities unless the major components are in close vicinity. This difficulty, however, can again be circumvented by proper choice of column material so that necessary distance between two peaks is obtained or by using the major component as carrier gas.

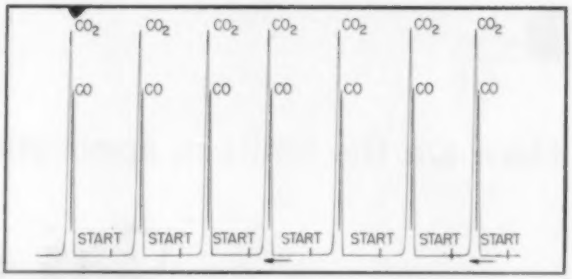
Qualitative Analysis

The time needed (retention time) for a given component to appear at the exit of the column is a particular characteristic of the component for a given column material (under known instrument conditions). Thus, components can readily be identified by comparison with reference materials in using the abscissa or time axis of recordings. Unfortunately, retention times are not just a function of the component and the particular stationary phase, but also a function of instrument parameters such as:

1. Flow rate and column pressure.
2. Temperature.
3. Dead volume between the point of injection and detector.



A PLOT of retention volumes of components for one stationary phase versus the same volumes for another stationary phase is representative of the relative interaction forces in the two types of stationary phases. The slopes of the converging lines are characteristic of molecular structure. Fig. 2.



PEAK HEIGHT REPRODUCIBILITY obtainable with a precision gas-sampling valve in a Model 154 Vapor Fractometer analyzing a 67% CO_2, 33% CO sample by the liquid partition-elution method. Fig. 3.

4. Carrier gas.
5. Column dimensions.
6. Concentration of fixed phase.
7. Particle size and surface characteristics of carrier solid.
8. Pressure drop through the column.

Retention times . . . Values for retention times are only of relative importance. For useful data transfer, the values must be converted to eliminate the experimental factors. Some authors have used retention volume which is the product of retention time and flow rate. This eliminates the knowledge of flow rate in data transfer. The temperature function is not a simple one and differs for each component so that results should preferably be stated at given temperatures.

Dead volume should be subtracted from retention times or volumes at all times since it represents an instrumental constant. It could be calculated from the dimensions of the instrument between the sampling and detecting section.

However, it is simpler to determine dead volume by measuring the time taken for a small sample of air or hydrogen (whose retentions in the stationary phase are sufficiently small to be neglected) to pass to the detector after injection. A small air peak is usually encountered in every run and, therefore, will automatically provide a correction value on each recording.

The correction for carrier gas is small and would be a constant in each case.

Column dimensions, concentration of fixed phase, particle size, pressure drop, and other factors can be easily combined into one single constant for each column so that standardization can be obtained in a simple manner.

Retention ratios . . . Another recommended procedure is to express peak locations of components for a given column material in terms of retention ratios to a given standard. This eliminates all the experimental factors simultaneously except for temperature. In this case, however, air peaks are not attractive as standards from the point of view of accuracy since the retention time is very small. Other standards should therefore be selected with reasonable long retention times to provide accurate retention ratios.

Chain length vs. retention volumes. . . If reference materials are not on hand for identification of unknowns, qualitative analysis is harder, since no structural information can be gathered upon first examination from these single peaks. However, it was found that the log of retention times, (volumes) or the retention ratios follow a linear relationship with chain-length (number of carbon atoms) or number of identical substituents for homologuous series. (Fig. 1). Thus, methane, ethane, propane, butane, pentane, and others, will be on a single straight line; iso-pentane. and others, on another, and so on.

Other structural information . . . Martin and others have also established that some structural information can be obtained from retention volumes by plotting retention volumes of components for one stationary phase (abscissa), against retention volumes of these same materials for another stationary phase (ordinate). Such a plot is representative of the relative interaction forces in two types of stationary phases and consists of straight lines converging to zero in which the slope is a characteristic of molecular structure. (Fig. 2).

If difficulties arise in qualitative analysis, it might also be pointed out that components could be collected at the exit of the instrument and then be analyzed by other means such as mass or infrared spectroscopy.

Quantitative Analysis

Large errors will be introduced when using nitrogen as carrier gas unless corrections are made for thermal conductivity differences.

Nonlinearity of thermal conductivity response with changes in component concentration is also commonly encountered.

Helium carrier . . . Both of these sources of error are considerably reduced by a helium carrier and high-sensitivity thermistor-type detector cells. Here, the large difference in carrier vs. component conductivity and the high detector sensitivity permits the use of extremely small samples so that the concentration of each component in the carrier streams when it passes through the detector is extremely small. We are therefore always measuring the conductivity of extremely dilute binary mixtures (generally between 0 and 5%).

Thermal conductivity . . . If we refer to a typical graph of thermal conductivity of binary mixtures such as those calculated by Bennett and Vines[1] it will be noted that conductivity vs. concentration plots are generally linear at low concentrations (0-12) of one material in another but become non-linear at higher concentrations.

Internal normalization technique . . . Since the area under each peak is proportional to the concentration of each component (and when using helium carrier and high-sensitivity detectors varies linearly with concentration) the area relationship can be used for calculating relative concentration of components present.

Peak areas may be determined by automatic integration, planimetry, peak height times ½ band-width

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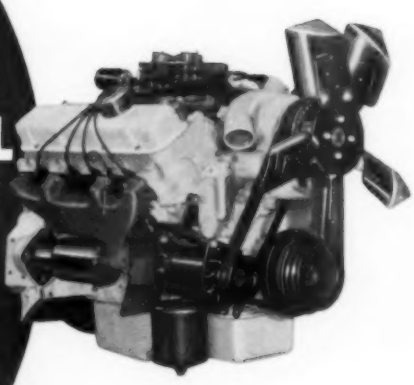

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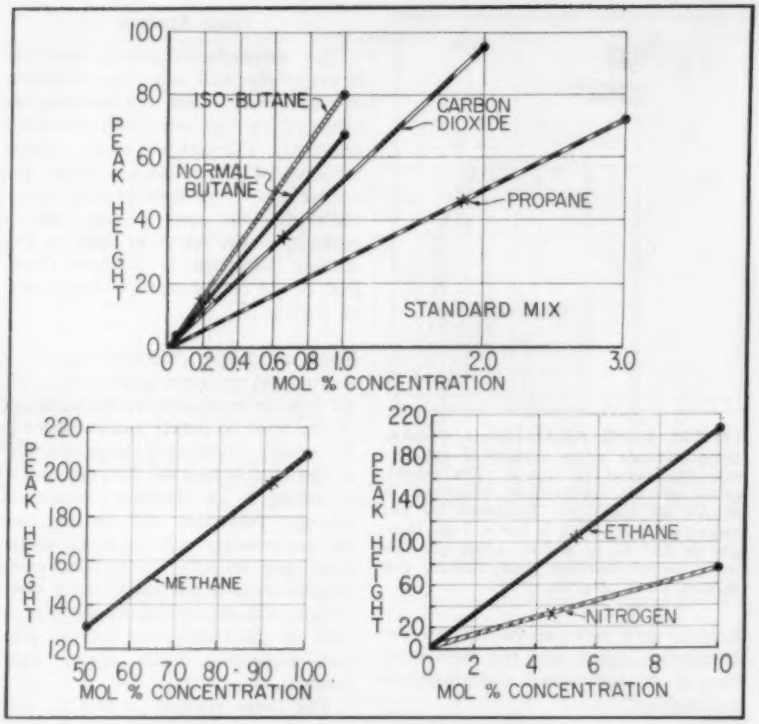
measurement, or even by weighing the paper resulting from cutting the band from the recorder strip chart.

The areas calculated are then corrected for difference in response of the thermal conductivity cell. These corrections may be obtained from the literature in some cases or may be experimentally determined by preparing known weight mixtures of components of interest, passing these mixtures through the vapor fractometer, and calculating the relative area response per unit weight of each component.

Any of the components may be assigned a standard response figure and the other materials calculated relative to this figure. For example, Rosie and Grob have calculated area response-weight of sample for many common hydrocarbons relative to benzene, which was assigned a standard response-weight value of 100.

After correcting the measured peak areas using the relative response factors, the concentration of each component is easily determined. The corrected areas of all peaks are added to give a total area which is normalized to 100%, therefore, the ratios of individual areas to this total directly give the weight per cent concentration.



CALIBRATION CURVES of concentration peak height may be derived from plots obtained by injecting a series of mixtures of known concentrations of components into the instrument and measuring resultant peak heights. These calibration plots are for natural-gas analysis. Fig. 4.

Internal standard technique . . . This consists of accurately adding a known amount of arbitrary compound (internal standard) to the sample mixture. Calibration curves can then be established by ratioing peaks at varying concentrations of components to the peak of the internal standard. This provides straight line plots. (Peak heights are linear with concentration when symmetrical band shapes are obtained. They are found to be generally as accurate as peak areas.) In this manner, the peak height of the internal standard is the actual measure of total mixture inserted into the stream of the instrument since this total volume cannot be determined very accurately.

The choice of such an internal standard depends entirely on the nature of the components to be determined and also on the concentration range in which these are present. It is generally recommended that the internal standard peak should be located in close proximity to the peaks of the components to be determined without overlapping, and that its range of concentration also be chosen to produce peak heights similar to the components of interest. In this manner, reproducibility of measurement will be quite satisfactory even if running conditions such as flow rate and temperature have varied slightly from run to run.

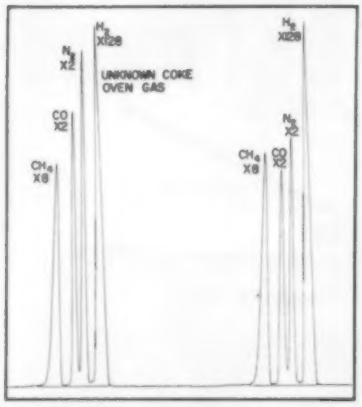
Peak height calibration . . . There are many problems where the measurement of areas of all component bands in a mixture is difficult, inaccurate, or unusually tedious. For example, the bands yielded by very low-boiling components of many mixtures are extremely tall and narrow, maximizing errors in band-width measurements. In other cases, the highest-boiling components of a mixture may be of no interest and the long period of waiting for their appearance merely for inclusion in the normalized area figure may be objectionable.

Peak heights of bands are easily and accurately measured on strip chart recorders and vary directly with component concentration. Within reasonable concentration limits in fact, peak height varies linearly with concentration. However, it must be borne in mind that peak height-concentration ratios unlike peak area-concentration ratios wil be altered radically by any change in flow, temperature, column length, or column substrate used in a determination. Further, since peak height varies inversely with retention time, the height of a band of one component has no concentration relationship to that of a band of another component eluted prior or subsequent to it.

The peak height calibration system therefore, is applied to specific components run under fixed and specified instrumental operating conditions. The precision of the pressure, flow, and temperature-regulating devices on the instrument must be great enough to assure reproducibility of these conditions.

In this type of procedure, it is most important that the sampling device used in it must have a precision at least as high as that desired in the analysis. Fig. 3 shows the reproducibility obtainable with a precision gas-sampling valve. It can be seen that the peak heights of the seven successive runs of a single sample are highly reproducible. The gas valve is in fact precise to ± 0.25%. Where liquids are being sampled, reproducibility of ± 0.5% is obtainable by use of a precision liquid sample, in which the volume of sample injected is controlled by the capacity of a capillary pipette.

By injecting a series of mixtures of known concentrations of components of interest into the instrument and measuring the resultant peak heights, calibration curves of concentration-peak height may be derived (Fig. 4). If an equal volume of a quantitatively unknown mixture containing any of these components is now injected into the instrument the resultant peak



TYPICAL RAPID ANALYSIS of a coke-oven mixture using system of calibration illustrated in Fig. 4. The fractogram of the calibration standard is shown at the right, followed by the unknown mix. This is for a 1-cc. sample at 25° C. in a 4-m. silica gel column, argon carrier, and 100-cc. per minute flow. Fig. 5.

heights may now be plotted on the calibration curve and the concentration of the component concentrations determined.

For routine repetitive analyses, where time can be profitably spent in setting up initial conditions and obtaining calibration data, this system of calibration using known standards has great advantage of simplicity and accuracy. It is particularly suited for the analysis of light gases. Fig. 5 shows a typical rapid analysis of a coke-oven gas mixture. A fractogram of a calibration standard containing 60% H_2, 4.0% N_2, 5.0% CO and 30% CH_4 is shown at the right, followed by the fractogram of the unknown mix. Since all these components have a linear peak height-concentration curve over short ranges a direct proportion of standard concentration: concentration of unknown = peak height of the standard: peak height of the unknown for each component. The contentrations for the unknown coke-oven gas is therefore found to be:

H_2 — 57%.
N_2 — 5.4%.
CO — 6.2%.
CH_4 — 28%.

It should be noted that the total is not 100%. The remaining 3.4% consists of other gases that are not considered in this analysis. They may, of course, be analyzed by the same procedure if desired. This is in contrast to internal normalization procedures in which all components must be accounted for in order to calculate an accurate measurement of any component.

Trace Analysis

The thermal-conductivity detector is extremely well suited to detection of trace components in a mixture because of its high sensitivity and nonselectivity. The cell will detect minute amounts of any material (except the carrier gas) regardless of that material's chemical nature. Any volatile material whose retention time on any column substrate is different from that of the component of interest will be detectable.

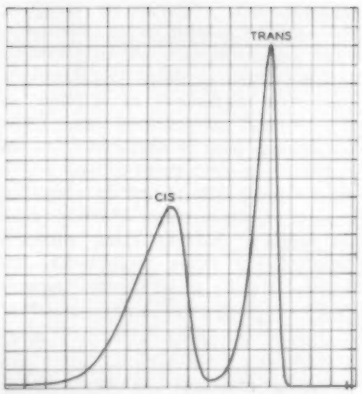
Need not know chemical type . . . At first, we need not know the chemical type or even suspect the existence of the trace to detect and measure it. By simply injecting a large quantity of the sample into the instrument and operating it at maximum sensitivity settings, responses will be obtained for components present down to the parts per million range. The exact sensitivity to a particular trace component will depend upon the elution time of the component and its relative separation from major components.

For these reasons, it can be seen that vapor-partition fractometry has excellent future potentialities in the field of trace analysis.

Getting additional sensitivity . . . For the determination of a trace component, additional sensitivity can be obtained, if required, by increasing the amount of sample introduced into the system. This will not affect speed or stability of the instrument. Consequently, major components will run off scale (multirange recorders or use of the precision step-range potentiometer provided on the instrument would eliminate this difficulty) and, therefore, internal normalization procedures can no longer be applied.

However, it is then possible to use internal standard techniques where the internal standard would also be added in an extremely small concentration range. It is also possible to use direct reading methods by more accurately controlling the total sample introduced. This is no longer a problem since larger sample quantities are then used.

Broadening bands . . . The only limitations in trace analysis, due to increasing the total sample amount, result from the major-component band broadening to such an extent that it starts to interfere with the trace component. This will have to be established empirically, but it is possible to predict that chances are better the further apart the trace-component peak is from the major component. The method is therefore practically



GAS CHROMATOGRAPHY can be used for separation of pure components as well as analysis. Larger column capacity may be required. This is separation of "cis" and "trans" isomers of dichloroethylene. A full milliliter of sample was used with air carrier at 5 psi. and 40° C. Fig. 6.

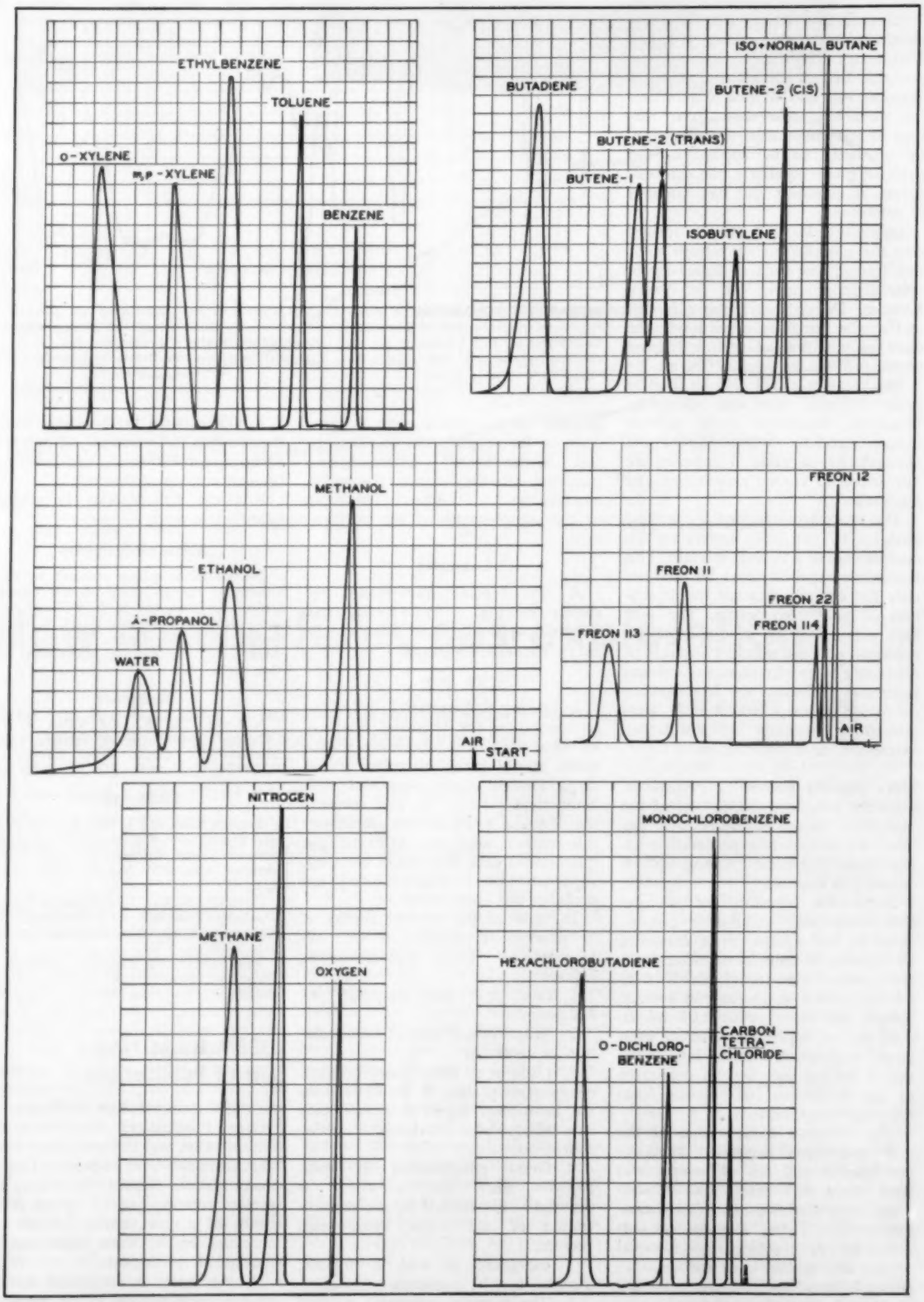
unlimited in cases where the trace is a low boiler and the major component a high boiler and vice versa.

Other limitations . . . For isomers, or close boilers, on the other hand, limitations may occur quite rapidly. Because sensitivity is generally poorer for higher-boiling components, it will be much easier to detect and measure traces of lower-boiling material in higher-boiling major components than vice versa.

Another method in trace analysis consists of using the major component as carrier gas. The system thus becomes insensitive to the major component and therefore eliminates possible overlapping or interference problems. (This method can also be applied to ordinary analysis where component overlap can not be eliminated by using other column materials.)

For example, nitrogen and oxygen are difficult to separate with common adsorption and partition columns. But it is possible to record the sample with helium as a carrier gas which will give a total figure for oxygen and nitrogen content. This determination is then followed by another using nitrogen as carrier gas which will provide a figure for oxygen alone. The nitrogen is then obtained by difference (or by using oxygen as carrier gas).

To summarize, the sensitivity in trace analysis is not a function of instrument characteristics and is practically unlimited if component peaks are far apart. Under less favorable separating conditions, the lower detectability limits will be entirely a function of how soon overlapping will take place when increased sample quantities are injected into the instrument.



TYPICAL FRACTOGRAMS illustrate potential applications in some important segments of the chemical industry. Fig. 7.

Miscellaneous Applications

Primarily, analytical chemists will benefit from the applications of vapor fractometry. However, it is very probable that physicists and physical chemists will also be able to gain useful thermodynamic data from this type of instrumentation. For example, the method can be applied to the study of phase equilibria, the determination of entropies and free energies of solutions.

Indirectly, this will provide insight into the mechanisms of various solution interactions such as dipole-dipole orientation energies, Van der Vaals, Keesom, Debye and London forces, and others. For these applications, the close examination of retention times would provide the data of interest.

Band shapes might also be used to study diffusion rates and adsorption hysteresis. Intensities could provide measurements for determining thermal conductivity of gases if samples are introduced in known proportions and quantities.

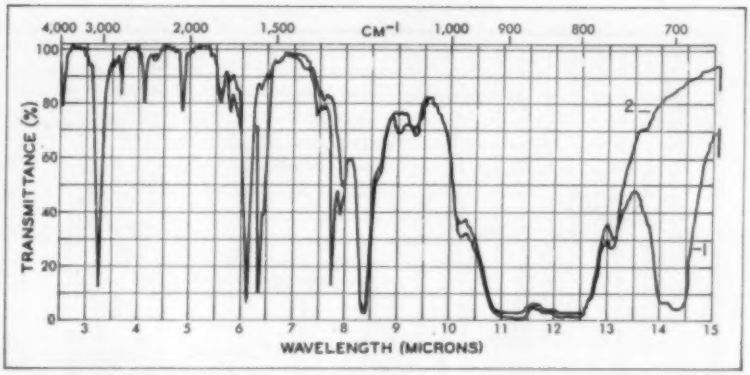
The gas-chromatographic method analyzes by physically separating the components of a volatile mixture. This separation capability may be used not only for analysis, but for the separation of pure components. The very high efficiencies of chromatographic columns, plus the selective separations attainable by careful choice of column substrates facilitates the fractionation of many mixtures which defy such separatory methods as distillation, extraction, or crystallization.

More capacity needed . . . However, since the samples generally suited for analytical chromatography are too small for worthwhile preparative applications, a general "scaling up" of capacity is required.

Since the capacity of a gas chromatographic column is proportional to the square of its diameter, an increase in column diameter from the standard 3/16-in. i.d. to 15/16-in. i.d. will permit an increase in average sample size from about 0.01 ml. to 0.25 ml. of liquid. In practice even larger samples are often used since this is limited only by the resolution of the component of interest from adjacent components.

Fig. 6 shows a separation of the "cis" and "trans" isomers of dichloroethylene. A full ml. of sample was used since the resolution between bands was adequate under these conditions. The "trans" isomer was collected by cold trapping. This material of 0.3 ml. volume was sufficient to fill an infrared spectraphotometer cell without the use of solvent.

Fig. 8 shows the infrared spectrogram of the purified trans-dichloroethylene superimposed upon a spectrum of the original sample. The absence in the "trans" dichloroethylene spectrum of the strong absorption band in the 14 μ region is indicative of the completeness of the purification.



INFRARED SPECTOGRAM of pure transdichloroethylene separated as shown in Fig. 6. Completeness of purification is shown by absence of the strong absorption band in the 14-region in the transdichloroethylene spectrum. No. 1 is dichloroethylene (cis and trans); No. 2 is dichloroethylene (trans)—0.1 mm. cell. Fig. 8.

Examples

A few typical fractograms are shown in Fig. 7 which illustrate potential applications in some of the major chemical industries.

In Sum

In looking at the general field of instrumentation for chemical analysis, an ideal analytical laboratory instrument should provide recordings of single lines or sharp peaks for each component present. In this manner, the abscissa provides the qualitative information and the ordinate the quantitative data. Practically speaking, vapor-partition fractometry approaches this ideal condition.

In view of the present results, it is possible to summarize the advantages for future applications as follows:

1. Low cost and simplicity of equipment.
2. Simplicity and ease of interpretation of recordings.
3. Little or no interference between components present in mixtures since the instrument separates components of a mixture as it measures their concentration.
4. Great potentialities in trace analysis since the sensitivity is practically not limited by the concentration of the major components present.
5. Inorganic, as well as organic, samples can be analyzed.
6. The sample amounts required for the analysis are very small (1 to 10 mg.).
7. Quantitative methods are easily transferable, independently of operator care, equipment used, and need no time-consuming calibrations.
8. Great potentialities in routine quantitative work.

Acknowledgements

The author is greatly indebted to Prof. Courtenay Phillips from Merton College, Oxford, England, and E. F. Williams from the American Cyanamid Research Laboratories, Stamford, Conn., for their kind advice and guidance in connection with this work.

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USBM Issues New List of Publications

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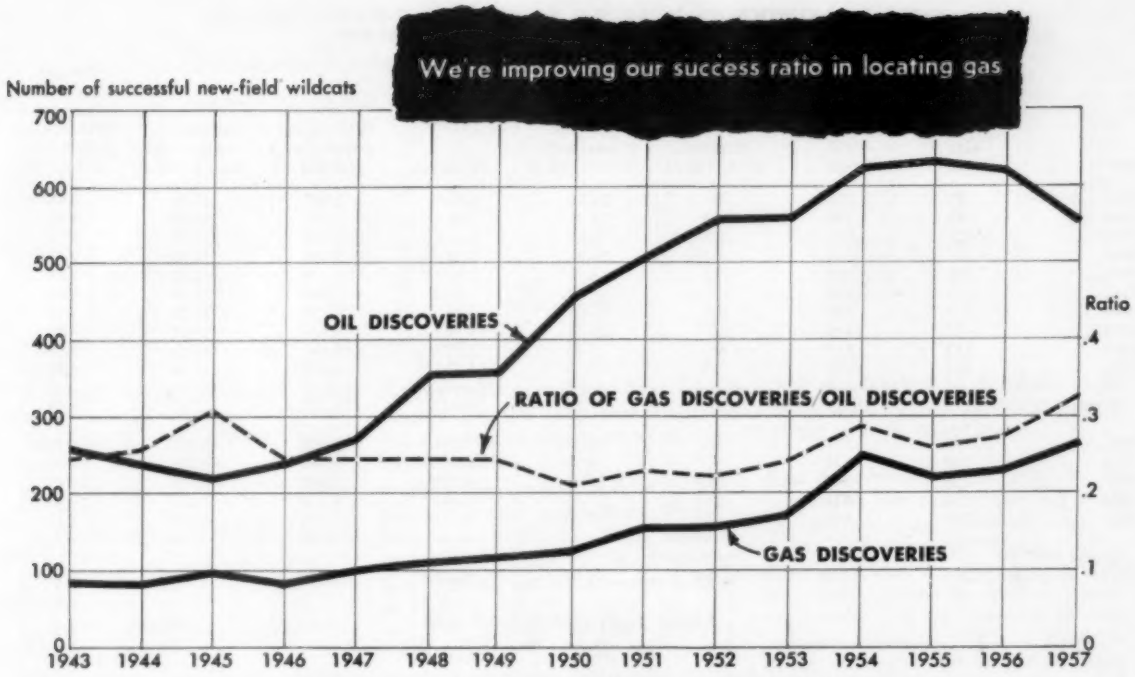


How successful is gas exploration?

Here for the first time is an analysis of the results of exploratory drilling for gas reserves. Gas exploration is as successful as oil exploration. The results show that only 1 new field wildcat out of every 10.78 exploratory tests drilled found production. However, in recent years the ratio of gas discoveries to oil discoveries has steadily climbed.

BY FREDERIC H. LAHEE
Consulting geologist, Dallas

TO A CERTAIN EXTENT the following statistical study is limited. This fact should be clearly borne in mind by all those who refer to this paper. In the first place, we are concerned solely with new-field wildcats. (A new-field wildcat is defined as an exploratory hole located and drilled on a geologic structure, or in a geologic environment, not yet producing oil or gas. Where such a structure or environment is ill-defined, the new-field wildcat must be several miles from the nearest production of either oil or gas.) All the data in all the accompanying tables pertain only to new-field wildcats, or to the fields discovered by such wildcats.

In the second place, our report covers drilling and reserves in only 17 of the oil-and-gas producing states of the country, namely, Alabama, Arkansas, California, Colorado, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Montana, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming. One significant reason for considering these 17 states, rather than the whole United States, is that in all former reports by the author the same 17-state area has been used; thus, we may make logical and correct comparisons of all the data presented, now and in the past.

These 17 states have long included 95% or more of the country's wildcat drilling, oil production, proved oil reserves, gas production, and proved gas reserves.

New-field wildcats . . . Before beginning a discussion of reserves, we may well examine the success-to-failure ratios as reported for new-field wildcats at the close of the year when drilling was finished and the wells were either completed for production or were abandoned as dry. We shall refer to this year as the "year of completion." For the successful completions, it is the "year of discovery."

Table 1 lists the data for December 31 of the year of completion for each of the last 15 years. Note that, although the number of new-field wildcats drilled in any given year varies from a low of 2,902 to a high of 8,458 (see Col. 6), the percentage of success (Col. 7) varies only between a low of 10.12 and a high of 12.54.

Reserve Picture

At the close of the year of discovery, not enough is known of the physical factors (geological, etc.) to determine the total ultimate recoverable reserves of gas or of oil from a new field. A period of several years of development history is necessary for such an estimate to be reliable. Therefore, we have omitted recent years and have limited ourselves to consideration of the data for the decade 1943 to 1952, inclusive. The estimates used herein were for the

This is an abridged version of an article that will appear in the September issue of the AAPG Bulletin under the title: "Statistics on Natural-Gas Discoveries."

TABLE 1—STATISTICS ON NEW-FIELD WILDCATS IN 17-STATES AREA, AS REPORTED AT END OF YEAR OF COMPLETION

Year	1 Gas wells	2 Oil wells	3 Total wells (Cols. 1 & 2)	4 Per cent gas wells in total wells (Col. 1/Col. 3)	5 Dry holes	6 Total new-field wildcats drilled (Col. 3 plus Col. 5)	7 Per cent successful wells (Col. 3/Col. 6)	8 One successful well to every new-field wildcats drilled (Col. 6/Col. 3)
1943	83	258	341	24.34	2,604	2,945	11.58	8.64
1944	83	246	329	25.23	2,693	3,022	10.89	9.19
1945	101	225	326	30.98	2,576	2,902	11.23	8.90
1946	77	237	314	24.52	2,691	3,005	10.45	9.57
1947	106	269	375	28.27	2,943	3,318	11.30	8.85
1948	115	356	471	24.42	3,608	4,079	11.55	8.66
1949	117	358	475	24.63	3,751	4,226	11.24	8.90
1950	117	460	577	20.78	4,567	5,144	11.22	8.92
1951	153	512	665	23.00	5,377	6,042	11.01	9.09
1952	161	558	719	22.39	5,715	6,434	11.18	8.95
Total	1,113	3,479	4,592	24.24	36,525	41,117	11.17	8.95
1953	178	564	742	24.00	5,886	6,628	11.19	8.93
1954	250	627	877	28.51	6,112	6,989	12.54	7.97
1955	226	643	869	26.00	6,819	7,688	11.30	8.85
1956	235	621	856	27.45	7,602	8,458	10.12	9.88
1957	265	563	828	32.00	6,781	7,609	10.88	9.07
Grand total for 15-year period	2,267	6,497	8,764	25.87	69,725	78,489	11.165	8.955

TABLE 2—STATISTICS ON GAS

Year	1 A	2 B	3 A&B	4 C	5 A&B&C	6 D	7 E	8 D&E	9 A to E, incl.	10 F	11 A to F, incl.	12 F divided by A to F, incl. per cent	13 Wells found to belong in old fields	14 Col. 9 plus col. 13
	Estimated total ultimate recoverable reserves after several years of development history													
1943	5	8	13	7	20	26	21	47	67	13	80	16.25	3	70
1944	2	2	4	12	16	23	24	47	63	14	77	18.18	6	69
1945	3	2	5	11	16	33	24	57	73	20	93	21.50	4	77
1946	1	2	3	7	10	22	29	51	61	12	73	16.43	5	66
1947	5	5	10	4	14	30	35	65	79	19	98	19.38	4	83
1948	3	3	6	7	13	33	35	68	81	19	100	19.00	2	83
1949	8	7	15	8	23	34	43	77	100	12	112	10.71	2	102
1950	4	4	8	8	16	28	44	72	88	19	107	17.76	8	96
1951	10	4	14	10	24	41	57	98	122	16	138	11.59	10	132
1952	10	7	17	7	24	44	65	109	133	15	148	10.14	11	144
Total	51	44	95	81	176	314	377	691	867	159	1,026	15.50	55	922

most part as of January 1, 1957, thus allowing a minimum of 4 years for development history (for the late discoveries of 1952).

Classifying gas reserves . . . After consultation with many persons experienced in the gas business, and with their approval, we have employed a system of classification similar to that used for oil. But values are based on the British thermal unit average equivalencies between oil and gas. This method is scientific and it very closely corresponds to equivalencies in weight. It is essentially fundamental.

For convenience, we shall use the following average approximate figures: for gas, one million B.t.u.'s per M.c.f., and for oil, six million B.t.u.'s per barrel. On this basis, we have the following classifications for total ultimate recoverable reserves of natural gas:

Table 4—Statistics

Year	1 A	2 B	3 A&B	4 C	5 A&B&C	6 D	7 E	8 D&E	9 A to E, incl.	10 F	11 A to F, incl.	12 Per cent, F divided by A to F, incl. (Col. 10/Col. 11)
	Estimated total ultimate recoverable reserves after several years of development history											
1943	7	9	16	17	33	69	200	269	302	25	327	7.64
1944	6	3	9	27	36	67	141	208	244	36	280	12.86
1945	6	3	9	23	32	77	139	216	248	52	300	17.33
1946	3	3	6	17	23	72	149	221	244	44	288	15.28
1947	8	12	20	15	35	82	164	246	281	67	348	19.25
1948	5	5	10	16	26	92	276	368	394	52	446	11.66
1949	17	11	28	17	45	99	215	314	359	90	449	20.04
1950	7	14	21	23	44	97	327	424	468	75	543	13.81
1951	11	5	16	23	39	112	402	514	553	77	630	12.22
1952	12	9	21	18	39	114	426	540	579	105	684	15.64
Total	82	74	156	196	352	881	2,439	3,320	3,672	623	4,295	14.51

TABLE 3—STATISTICS ON OIL

Year	1 A	2 B	3 A&B	4 C	5 A&B&C	6 D	7 E	8 D&E	9 A to E, incl.	10 F	11 A to F, incl.	12 F divided by A to F, incl. per cent	13 Wells found to belong in old fields	14 Col. 9 plus col. 13
	Estimated total ultimate recoverable reserves after several years of development history													
1943	2	1	3	10	13	43	179	222	235	12	247	4.86	17	252
1944	4	1	5	15	20	44	117	161	181	22	203	10.84	17	198
1945	3	1	4	12	16	44	115	159	175	32	207	15.45	15	190
1946	2	1	3	10	13	50	120	170	183	32	215	14.88	7	190
1947	3	7	10	11	21	52	129	181	202	48	250	19.29	17	219
1948	2	2	4	9	13	59	241	300	313	33	346	9.54	9	322
1949	9	4	13	9	22	65	172	237	259	78	337	23.14	13	272
1950	3	10	13	15	28	69	283	352	380	56	436	12.87	17	397
1951	1	1	2	13	15	71	345	416	431	61	492	12.39	18	449
1952	2	2	4	11	15	70	361	431	446	90	536	16.79	4	450
Total	31	30	61	115	176	567	2,062	2,629	2,805	464	3,269	14.20	134	2,939

A. Fields having 300 billion cubic feet, or more, of reserves.

B. Fields having 150-300 billion cubic feet.

C. Fields having 60-150 billion cubic feet.

D. Fields having 6-60 billion cubic feet.

E. Fields having less than 6 billion cubic feet.

F. Fields abandoned because nonprofitable.

Table 2 presents data on gas reserves, credited to the year of discovery. The numbers refer to fields having the indicated reserves. Taking the whole 17-state area into consideration, "E," on the average, may be regarded as close to the economic limit. F is used for fields, which, at first assumed to be commercial, subsequently turned out to be uneconomical and so were abandoned.

Since oil and gas are closely related in many ways, we have included statistics on oil for the same 10-year period as that studied for gas. In Table 3 data for oil reserves are presented in exactly the same manner as in Table 2 for gas.

Table 4 combines the figures of Tables 2 and 3, all on the basis of B.t.u. equivalencies. However, it goes farther than either Table 2 or Table 3 in deriving the final percentages of success after several years of development history.

There are several facts to be considered in this connection. Failures include both the dry holes reported at the close of the year of completion (Col. 16) and the abandonments listed as F (Col. 10). This total, for each year, is recorded in Col. 17. Successes (Col. 15) include all the discovery wells which located the fields, the reserves of which are designated by A, B, C, D, and E (Col. 9) and also those producing wells (Col. 14) which were originally classified as new-field wildcats, but which were subsequently found to be within older fields. These were certainly successful even if they did not discover new fields. Their reserves were allocated to these older fields.

At the close of the year of completion, 1 new-field wildcat out of every 8.95 drilled was classed as successful (Table 1, Col. 8). But after development history corrected the early assumptions, only 1 new-field wildcat out of every 10.62 drilled, was proved to be successful. This figure—1 in 10.6 drilled—is more important and closer to the truth, in the long run, than the figure 1 in 9 which, as we have stated, applied to data at the end of the year of completion.

Gas discoveries . . . It may not be obvious to the reader why we made the analysis just described only in Table 4, and not in Tables 2 or 3. This is because the drilling of a new-field wildcat well is seldom undertaken with gas, or with oil, as the specific objective. Such a well is drilled for either oil or gas or both, and it is properly called successful if it finds either or both. But no one can say, at the end of the year of completion, that one division of the dry holes comprised gas-well failures and that the rest of the dry holes were oil-well failures. All the dry holes must be considered in relation to the sum of all the producers, both gas and oil, whenever figures are assembled from the year of completion.

How successful is gas exploration? . . . There is a rather arbitrary way in which we might arrive at a success-to-failure ratio for gas. For instance, we may assume, for convenience, that since in the decade under consideration, 24.24% of the reported producers were gas-discovery wells, correspondingly, 24.24% of the dry new-field wildcats of the same decade were failures as gas wells. This figure is 24.24% of 36,525 (see Col. 5, Table 1), which equals 8,854. If we add to this the abandonments of gas wells (Col. 10, Table 2) we have 8,854 plus 159, or 9,013 failures, as contrasted with 867 plus 55 (Col. 14, Table 2) for successful gas discoveries. These figures give us a success percentage of 9.28, or 1 successful gas field resulting from every 10.78 "gas" wells drilled. As we have said, this is an extremely arbitrary approach to the problem. We believe our method of combining oil and gas discoveries and relating these to total dry holes is more logical and more precise; but by either method the results are very close (10.6 in the oil-plus-gas approach and 10.78 in the "gas only" approach).

On Gas Plus Oil

13 Per cent E divided by A to F, incl. (Col. 7/Col. 11)	14 Successful, but belonging in old fields	15 Total successful (Col. 9 plus Col. 14)	16 Dry at end of year of completion	17 Total unsuccessful (Col. 10 plus Col. 16)	18 Percentage success (Col. 15/Col. 15 plus Col. 17)	19 One successful new-field wildcat in every — drilled (Col. 15 plus Col. 17 divided by Col. 15)
61.16	20	322	2,604	2,629	10.91	9.16
50.36	23	267	2,693	2,729	8.91	11.22
46.33	19	267	2,576	2,628	8.91	10.84
51.74	12	256	2,691	2,735	8.56	11.68
47.13	21	302	2,943	3,010	9.12	10.97
61.88	11	405	3,608	3,660	9.96	10.04
47.88	15	374	3,751	3,841	8.87	11.22
60.22	25	493	4,567	4,642	9.60	10.42
63.81	28	581	5,377	5,454	9.63	10.39
62.28	15	594	5,715	5,820	9.26	10.80
56.79	189	3,861	36,525	37,148	9.41	10.62

Here's operation of feedback controls

on crude and product-pipeline pumping stations

PUMPING-STATION feedback controls are provided to constantly monitor suction pressure, discharge pressure, and pump load, and to assume control of these variables when required. Stations are generally engineered to handle maximum design throughput under normal conditions without exceeding safe limits of operation.

Feedback controls assume command only when (a) suction pressure drops toward a value where cavitation may occur, (b) discharge pressure approaches maximum operating pressure of the pipe, or (c) pump load begins to cause excessive motor current.

Fig. 1 shows typical feedback controls on a station utilizing a constant-speed induction motor driving a centrifugal pump. Control of the system is through an electric or electrohydraulically actuated throttling valve on the pump discharge.

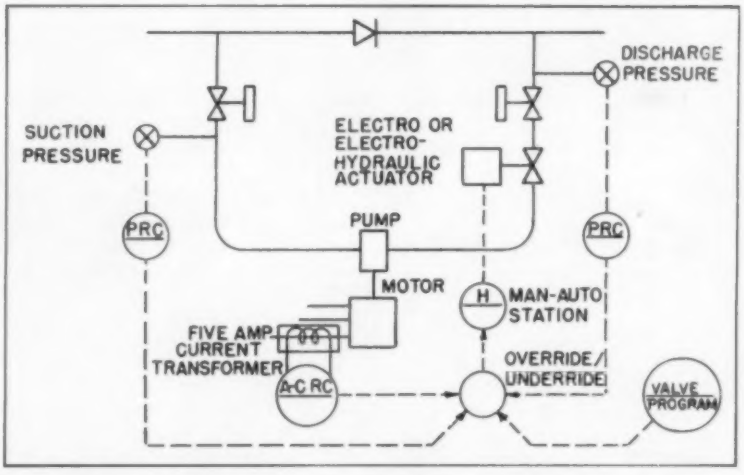
The use of a completely electric or electrohydraulic system eliminates the need for an air compressor and drier, and the associated maintenance. The price of compressor and drier quite often equals the price of the control system.

Instead of a flow override, a motor current override is used. Flow override for load monitoring is inflexible to varying specific gravities, consequently flow of a light fluid is unnecessarily limited when the limit setting is based on a heavier fluid. Motor current is the variable being safeguarded and it is best monitored directly rather than by secondary means.

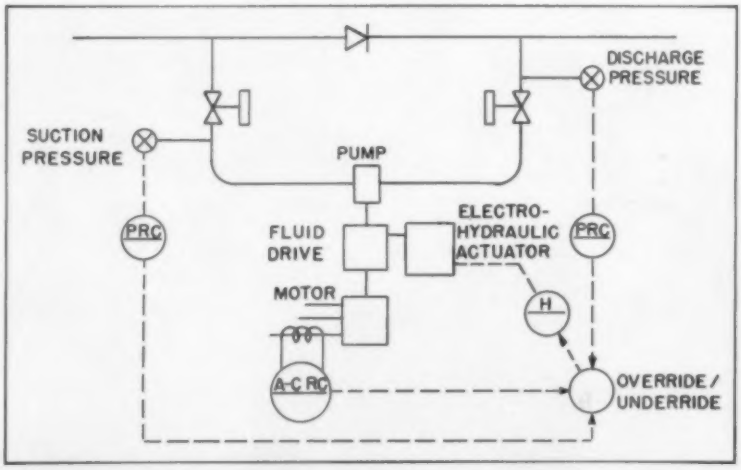
The fourth input to the override system is from an electronic programer which, after an initial time delay, programs the station onto the line by opening the valve at preset rate.

The voltage into the override is held constant at its final value until the unit is deenergized, at which time it automatically resets itself to the initial starting value. This particular unit is also applicable in programing internal-combustion engines onto the line.

Presented at University of Oklahoma automation conference.



TYPICAL FEEDBACK CONTROLS on station using constant-speed induction motor driving centrifugal pump. Fig. 1.



TECHNIQUE used to obtain override control by varying pump speed. Control is accomplished by electrohydraulic actuation of scoop tube in fluid-drive power-transmission device. Fig. 2.

Override Control

Fig. 2 shows a technique used to accomplish override control by varying pump speed rather than throttling the discharge valve. Control is accomplished by electrohydraulic actuation of a scoop tube in a fluid-drive power-transmission device.

The efficiency of variable-speed fluid drive is approximately proportional to the ratio of reduced speed to motor speed. The brake horsepower varies as the cube of the speed. It becomes apparent then that where stations are operating under throttling

BY W. M. BLISS
Chief Applications Engineer
Swartwout Co., Cleveland

conditions, often the case in product pipelines, savings in power can be made.

The pipeline company using this technique claims it will be able to pay off the investment for the control system in 2 years. It also claims less maintenance. This technique is not new, having been applied to high-pressure boiler feed pump control for years.

There are other methods of closing the control loop. Governor control of internal-combustion engines has been used, as well as eddy-current clutch control of constant-speed induction motor. All methods use essentially the same type of feedback control.

Monitoring Motor Current

Fig. 3 shows a scheme used on two-stage systems where total motor current only is monitored. By providing two set-point units in series (differential - transformer secondaries in series) the set points can be made additive. The secondaries are not effective (signal is zero) unless their primaries are given excitation.

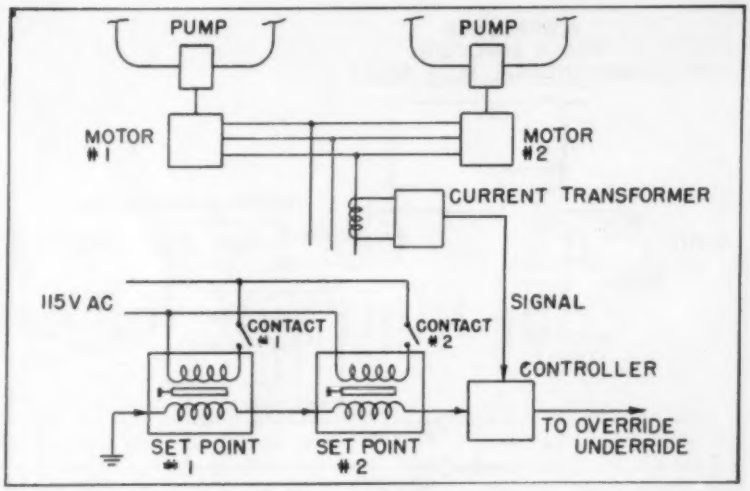
Therefore, through the use of relays, one set point can be thrown in when one motor is started and the other added to the first when the second unit is started. If a 40% set point is required for one motor, the set point for two would be 80%. Positioning of the core in the transformers determines the output signal from each.

Control is based on the use of resetting or integrating controllers and diode circuits functioning as check valves to allow the dominant signal to assume command. The set points for the controllers are the reference points delineating the area between safe and unsafe operation.

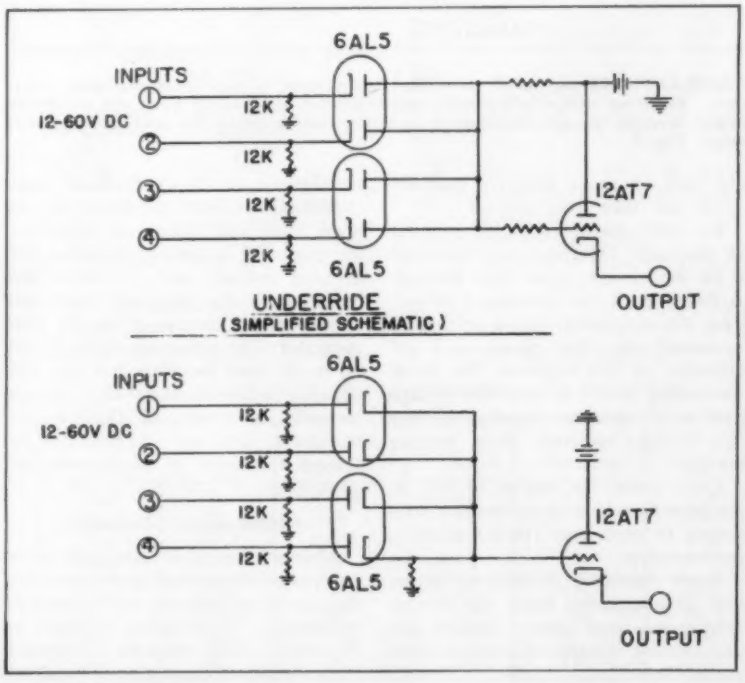
Under normal operation the measured variables will be within the safe area. As long as a deviation exists between the measured variable and the reference, the controller output will continue to drive (resetting action) in such a direction as to eliminate the deviation.

Since the design conditions are such that during normal operation at maximum throughput this deviation cannot be eliminated (full-speed operation and valves wide open), the controller output will have driven in such a direction as to put the station into capacity operation.

Should any of the measured variables reach or exceed the reference setting, the resetting function of the controller will cause the controller output to drive in the opposite direction. The system is designed so that a control signal deviating from the others in this direction will assume command and throttle the final actuating device to maintain control at the reference point.



TOTAL MOTOR CURRENT only is monitored in this two-stage system. By providing two set-point units in series the set points can be made additive. Fig. 3.



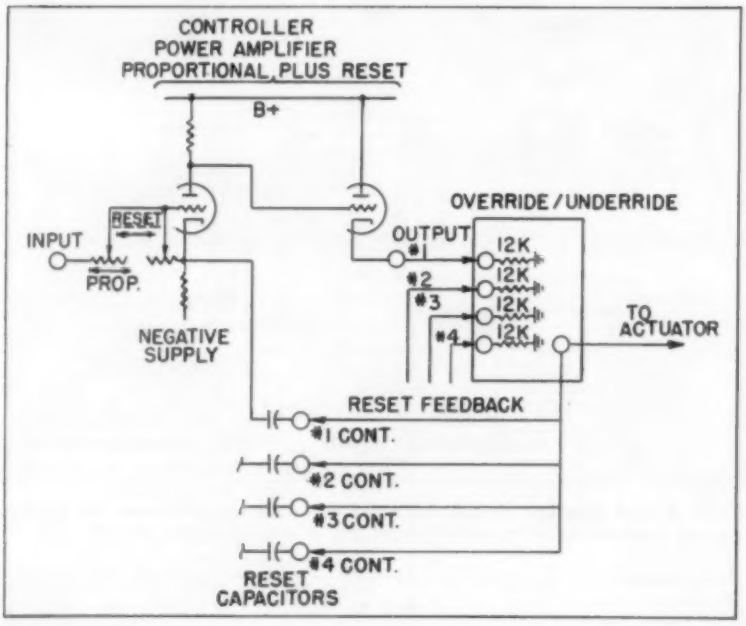
SIMPLIFIED SCHEMATIC shows underride (top) and underride unit. Underride is more often used. Fig. 4.

Underride and Override Unit

Fig. 4 shows the simplified schematic of the underride and override unit. Underride is the most prevalent, although override is occasionally used. In the underride unit the controller-output voltage, or valve-program voltage, is impressed on the cathode of a diode, (12,000-ohm resistors to ground are used to hold controller-output current to 1-5 ma. while voltage varies from 12 to 60 volts d.c.).

All plates are tied together and have a common B+ supply. A cathode voltage slightly lower than plate voltage will cause the diode to conduct and since all plates are tied together all plate voltages will be lowered to that of the conducting diode.

If the other cathode signals are higher they will be blocked. The passed signal controls the grid of the cathode follower and provides an output voltage essentially equal to the input. At



POWER-AMPLIFIER section of controller incorporated proportional and reset functions. Resetting action is normally accomplished by feeding back the controller output through a capacitor and a variable resistance to the grid of the input stage. Fig. 5.

any time, a more negative cathode signal can take over control.

The override-unit operation is based on the same technique but modified to let the highest signal pass through to the grid of the cathode follower. Here the controller-output voltage is impressed on the plates and all cathodes are tied together. The diode conducting serves to raise the voltage level of all cathodes thereby blocking any lower voltages from passing through.

Limit stops, not shown in Fig. 4, are incorporated in these units to limit output to zero and 100%, avoiding reset windup.

Reset feedback is used to insure that all controllers track the voltage driving the final control element and that smooth transfer of control is accomplished.

Reset Feedback

Fig. 5 shows this scheme. This is the power-amplifier section of the controller which incorporates the proportional and reset functions. Resetting action is normally accomplished by feeding back the controller output through a capacitor and a variable resistance to grid of input stage.

If this feedback to the reset capacitor is through the override unit and is fed back to all controller reset capacitors, all dormant controller capacitors will track the output of the dominant controller. The dormant controller outputs are effectively open-circulated in closing the feedback loop.

Although these controllers are on open loop and therefore saturated, the controller assuming command will respond instantly and its output will be equal to the previously dominant control signal impressed on its reset capacitor. The power-amplifier circuit up to the reset feedback has very low capacity and therefore can change instantly, on command. Once a controller is dominant it has the resetting functions of a conventional controller.

Maintenance Minimized

Maintenance of controls and allied equipment in unattended stations must necessarily be reduced to the absolute minimum. Maintenance should be preventive rather than on emergency.

In electronic control equipment this means that the vacuum tubes should be checked at regular, predetermined intervals and replaced before they fail. Use of premium grade tubes will assure life expectancy of 5,000 to 10,000 hours. Radio-grade tubes, properly aged before use, have life expectancy ranges from 1,000 to 5,000 hours.

The manufacturer of electronic control equipment has the responsibility of providing reliable components in his circuits, and designing his circuits with the minimum components necessary to provide good quality control. Also, it is imperative that the components be used at levels below their rated values when this will provide greater reliability.

The electronic pickup device in the transmitters should be made as simple and rugged as possible, and be capable of being explosionproofed and weatherproofed.

System components—recorders, indicators, controllers, manual controls, converters—should all be of the plug-in type so that the entire unit can be easily replaced. Now, with reliable, low-maintenance control systems readily available, the pipelines can seriously consider remote control and unattended stations. Remote set-point adjustment and remote manual control of the throttling device through digital telemetering may be a possibility within the next few years. Beyond this is computer control.

The manufacturer of control instrumentation, in his effort to keep pace with the changing course of automation, is often faced with apparent confusion in the user industries he is so conscientiously trying to serve. A wide divergence of control ideas in these industries is really a healthy sign provided there is frequent opportunity to openly discuss these ideas and requirements.

ASA Approves Revisions In ASTM Standards

THE American Standards Association has approved revisions made in 1957 in two standards of the American Society for Testing Materials covering steel pipe flanges and fittings. The revised standards are:

ASTM Designation A 181-57 T, ASA G46.1-1958, Tentative Specifications for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for General Service (ASME Boiler and Pressure Vessel Code Specifications No. SA-181).

ASTM Designation A182-57 T, ASA G37.1-1958, Tentative Specifications for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service (ASME Boiler and Pressure Vessel Code Specification No. SA-182).

Changes in revised American Standard G46.1 (ASTM A181) affect material for forgings and retests. Changes in revised American Standard G37.1 (ASTM A182) affect material for forgings, hydrostatic test, and retests. The two standards are endorsed by the Manufacturers Standardization Society of the Valve and Fittings Industry.

Copies of the revised standards are available at 30 cents each from American Standards Association, Dept. PR 4, 70 East Forty-fifth Street, New York 17, N. Y.

MODERN DRILLING

When ordering wire rope, be sure to get

The right size for the right job

WIRE ROPE is manufactured in a full range of sizes to meet the requirements of all types of equipment. The strength of a wire rope is determined by its size, grade, and construction. In most cases, rope-using equipment has been designed for a specific size rope so that there is generally no leeway in the selection of the proper size to use.

The diameter of a wire rope is expressed by the diameter of a circle enclosing it. Fig. 1 shows the correct method for determining the true diameter.

It is extremely important that the grooves of sheaves and drums be of the correct dimensions to properly seat the rope. Tight grooves result in excess wear and rapid deterioration of the rope through fatigue due to the binding of the strands. Grooves should be checked regularly and when found to be worn, sheaves should be regrooved or replaced. This is particularly important when installing new rope on old equipment, as new rope will undoubtedly be somewhat larger in actual diameter than the worn rope it replaces and the bottom of the grooves may have become worn to the diameter of the rope removed.

Sheave grooves may best be measured by means of a groove gage, which is usually made to include the standard oversize tolerance for the particular size of rope involved. If the correct-size groove gage does not properly seat in the sheave groove, it is positive proof that the wire rope will be pinched in the groove and the life of the rope will be shortened.

Taken from LeBus-International Engineers, Inc., wire-line-spooling handbook.

TABLE 1—SHEAVE GROOVE DIAMETER TOLERANCE

Nominal wire-rope diameter (in.)	Tolerances of groove diameter (in.)
¼-⅜	+1/64 min. to 1/32 max.
⅜-¾	+1/32 min. to 1/16 max.
⅞-1⅛	+3/64 min. to 3/32 max.
1⅛-1½	+1/16 min. to 1/8 max.
1⅛-2¼	+3/32 min. to 3/16 max.
2⅛ and larger	+1/8 min. to 1/4 max.

Capacity of Drum

The following formula may be used for computing the rope capacity (L) in feet for any size drum or reel. This formula is based on uniform rope winding and will not give correct results if rope is wound non-uniformly in the reel. The dimensions shown in Fig. 2 are to be taken in inches:

$$L = (A + B) \times A \times C \times K$$

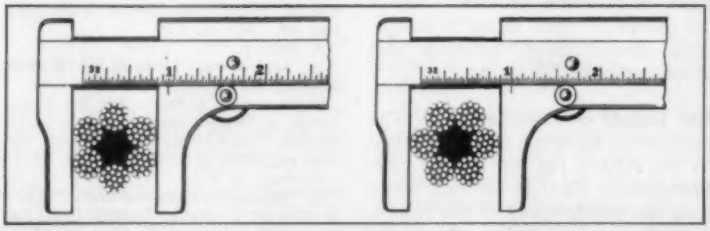
Where:

- L = rope length in feet.
- A = depth of rope layer in inches = (H − B)/2 − M.
- B = diameter of drum in inches.
- C = width between reel flanges in inches.
- M = desired clearance.
- K = constant as shown in Table 2.

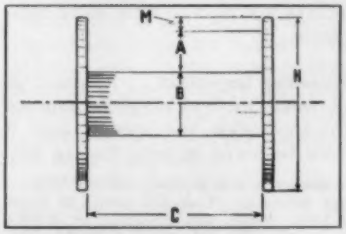
Value of "K" is computed from the formula: $K = 0.262/d^2$, where d = nominal rope diameter.

TABLE 2—VALUE OF "K" FOR VARIOUS WIRE-ROPE DIAMETERS

Nominal Rope Dia.	K	Nominal Rope Dia.	K	Nominal Rope Dia.	K
1/32"	270.	5/16"	2.68	1¼"	.168
3/64	119.	⅜	1.86	1⅜	.139
1/16	67.2	7/16	1.37	1½	.116
5/64	43.0	½	1.05	1⅝	.099
3/32	29.8	9/16	.828	1¾	.086
7/64	21.8	⅝	.671	1⅞	.075
⅛	16.8	11/16	.554	2	.066
5/32	10.7	¾	.466	2⅛	.058
3/16	7.44	13/16	.397	2¼	.052
7/32	5.48	⅞	.342	2⅜	.046
¼	4.19	1	.262	2½	.042
9/32	3.31	1⅛	.207		



CORRECT METHOD of determining true wire-rope diameter is shown at right. Incorrect method of measurement is shown at left. Fig. 1.



DIMENSIONS ABOVE can be used in formula for wire-rope length. Fig. 2.

The REFINER'S NOTEBOOK

How to find phenolic, settleable solids in

Industrial waste water

BY C. K. RICE

PHENOLIC-TYPE COMPOUNDS may occur in waste waters from petroleum refineries. One of the most perplexing and difficult questions that face the laboratory is the selection of the method to be used for determining the concentration of phenolic-type material.

API method for phenols . . . The API has published two methods for phenols.[1,2] One of these is a colorimetric nitrosophenol method for alkyl phenols. The other method is the 4-aminoantipyrine procedure.

The first of these methods is claimed to be generally applicable to phenolic-type compounds which have at least one ortho or the para position unsubstituted. The method is applicable in concentration from 0.01 p.p.m. to 100 p.p.m. The method appears to be rather good for its proper application. However, the precision obtained with this method is probably not better than 20% of the mean value.

The latter method may be applied to phenolic compounds in which the para position is not blocked by a functional group. Furthermore, phenolic compounds that are substituted in the para position generally will not give a color.

"Standard Methods" provides two procedures for the determinations of phenolic-type materials.[3,4] One of these again is the 4-aminoantipyrine method while the other is the old, classic Gibbs procedure.

The Gibbs method . . . This is not applicable to a satisfactory extent to testing waste effluents from a petroleum refinery. The presence of such materials as sulfides or other reducing substances will prevent the development of color, while nonphenolic materials such as aromatic amines will react to form color complexes.

Screening important . . . Regardless of which method might be selected for application in a specific case, it must be borne in mind that an adequate screening procedure is required before the method of test itself.

It is usual to add copper sulfate to the sample, adjust the pH, and then distill until only a small amount of bottoms is left in the flask. The distillate normally is extracted with a solvent such as chloroform. The phenols are reextracted into sodium hydroxide and the color formed subsequently in the aqueous phase. For greater sensitivity, the phenolics sometimes are reextracted from an acidified solution with fresh chloroform. In this case, the color is formed in the chloroform extract.

Many claims have been advanced as to the precision and accuracy of the 4-aminoantipyrine method. It would be difficult to establish for any specific application the exact precision and accuracy of the method. It is known, however, that this method under the technique of an experienced operator is extremely sensitive. Under ideal conditions as little as a fraction of one part per billion phenol may be detected.

Not specific . . . Slowly it is being realized that this method is anything but specific for phenolic-type compounds. Something more than 40 or 50 different compounds which will react with this reagent have been identified. It is unlikely that many of these interfering materials would be present to an appreciable extent in the waste effluent from a petroleum refinery. However, the fact that such interferences do exist needs to be recognized.

Settleable Solids

The solids that might be present in the effluent from a petroleum refinery are of various types. The settleable solids provide some of the more bothersome problems. These are caused by such things as coagulants, contact clays, sediment, and spent catalysts.

Old Imhoff cone method . . . The method for settleable solids published by the API is the old Imhoff cone procedure.[5] This is nothing more than the measurement of the volume of sediment collected in the tip of a cone after settling for a specified period of time. This same procedure appears in "Standard Methods."[6]

By weight . . . "Standard Methods" also provides a technique in which the settleable matter is actually determined by weight.[7] This is a differential method in which the suspended matter is measured before and after settling for a specified period of time. This procedure falls down in a definition of "settleable matter."

It defines this material as the matter which will not stay in suspension during the settling period either by virture of settling to the bottom or floating to the top. Thus, by this definition, floating oil would be considered settleable matter.

ASTM . . . ASTM takes a more realistic viewpoint on this particular determination.[8] In this method, "settleable matter" is defined as that matter which passes through a 2,000-micron sieve and which can be separated by sedimentation for 1 hour.

It is sharply differentiated from "floating matter" which is that material which passes through the 2,000-micron sieve and can be separated by flotation for 1 hour. This method provides for the determination of the settleable matter in terms of weight.

It is extremely difficult to forecast the precision and accuracy of any of the methods provided for this determination. The precision and accuracy will depend too much on drying temperatures and the nature of the residue.

References

1. "Manual on Disposal of Refinery Wastes," API 715-53, Vol. 4, Amer. Petrol. Inst.
2. Ibid., API 716-53.
3. "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," Amer. Pub. Health Assoc., Inc., 10th ed., 1955, p. 337.
4. Ibid., p. 339.
5. "Manual on Disposal of Refinery Wastes," API 709-53, Vol. 4.
6. "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," Amer. Pub. Health Assoc., Inc., 10th ed., 1955, p. 272.
7. Ibid., p. 272.
8. "Manual on Industrial Water," ASTM D 1069-54 T, ASTM Special Tech. Pub. No. 148-B, 1956, p. 361.

Author is coordinator, refinery technology laboratory, Gulf Oil Corp., at Philadelphia. Paper was presented at WPRA waste-disposal symposium at Wichita.

Here are tips on

How to prevent compressor failures

HERE'S HOW to start electric-motor-driven compressors:

1. If any work has been done on a compressor, before starting, turn over by hand at least one revolution to make sure everything is clear.

2. Always be sure cooling water is circulating through compressor before attempting to start. If the operator neglects to turn on the water and starts the compressor first, do not turn cooling water into the compressor, but shut down and allow the compressor to cool before again attempting to start.

3. Always be sure ventilating system or systems are in operation before attempting to start.

4. Always pour oil over the bearings, crankpins, and crosshead pins before starting compressor after the crankcase has been drained or cleaned or after a long shutdown.

5. Do not overlubricate cylinders and valve. Refer to manufacturer's instruction book for means of determining correct amount of lubrication.

6. Any time that any bearing is taken up, watch this bearing very carefully for a reasonable length of time to be certain that it is not too tight.

7. Never open a gas cylinder without first purging it, and making sure proper steps have been taken to blank or block off the cylinder, and the proper authority obtained.

Trouble Shooting

If engine will not start:

1. Check to see if condensate is present in the air-starting lines. If condensate is carried into the power cylinders, the spark plugs may be fouled.

2. Make sure the correct fuel gas pressure is at the engine.

3. If the fuel gas line has been opened recently, make sure the gas line is blown thoroughly to get rid of air from within the piping.

4. Check the oil-pressure stop switch.

5. Check the overspeed stop switch.

If air-starting system will not work:

1. Have correct starting-air pressure.

2. See that the engine is not loaded.

3. Have the air-starter check valves, which are located in the power cylinder heads, checked.

If engine will not handle the load:

1. Check the compressor suction and discharge pressures and temperatures to detect defective valves. Are any valves overheated?

2. Check the operation of the lubricator to be certain that the power and compressor cylinders are being lubricated properly.

3. Check the pressure of the fuel gas supply at the engine.

4. On Clark compressors have the fuel injection valves checked for excessive clearance and leakage. Leaky valves will be decidedly hot. Check for stuck fuel-mixing valves on Ingersoll-Rand compressors.

To help obtain good operation:

1. Give special attention to keeping the entire ignition system in good shape. Keep oil off of ignition wires. If cable is oil soaked, have it replaced with new lengths.

2. Always keep magneto-wire compartment closed to prevent dirt from entering. This will minimize bearing wear, also corrosion of wires.

3. Keep plenty of warm water circulating through the engine at all times.

4. The correct amount of lubricating oil for the crankcase and power cylinders should be maintained at all times. Keep oil cans covered.

The compressor compartment of the lubricator is usually filled with the same oil used in the power-cylinder compartment. There may be exceptions to this, due to the wide range of conditions encountered when compressing various gases over a wide range of pressure and temperature conditions. Use the correct type of oil in the right place.

5. Stop oil leaks as quickly as possible. The leaking oil may run down the foundation, seep under the grouting, and destroy the grouting job.

6. Never permit the oil level in the engine crankcase or lubricator to become too low or to run dry. When oil in crankcase is exposed to atmosphere during servicing operation on the engine, exercise all precautions against entry of water or dirt.

7. Do not put a heavy load on a cold engine. Allow it to warm up first. Otherwise, a cracked cylinder or cylinder head may result.

8. Never turn water on a hot engine. If you have forgotten to turn on the cooling water when starting up, shut down the engine and let it cool off.

9. Never attempt to start the engine without unloading the compressor cylinders.

10. Check temperatures and pressures after the engine has been started. Do not permit an engine to continue to run if no reading is shown on the oil-pressure gage, or if the pointer on the gages surges back and forth. Shut down and investigate or have the trouble investigated by the mechanical people.

11. Should the lubricator reservoir be allowed to run dry, it may be necessary to prime each pump again.

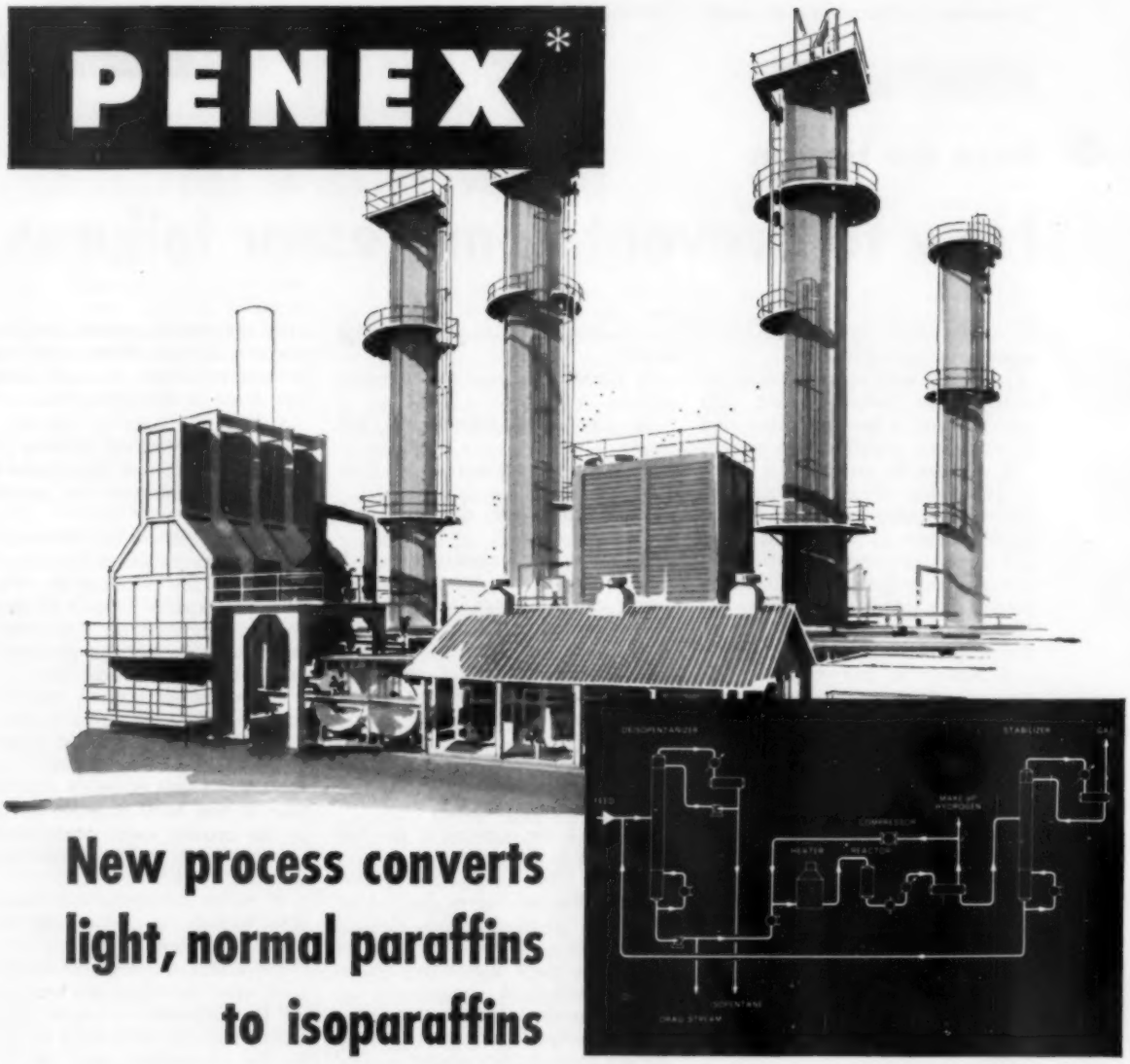
12. Break in new compressor-rod packing gradually.

13. Keep the air filters clean at all times. Low scavenging-air pressure on the Clark compressor indicates the air filter is dirty or the scavenging cylinder valves are broken. High pressure indicates the power-cylinder inlet ports are carboned up. Dirty air filters will prevent proper air-fuel mixtures in both the Clark and Ingersoll-Rand compressors.

14. When operating at maximum load, use minimum supply of fuel gas. Do not choke the engine.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso Standard Oil Co.

PENEX*



New process converts light, normal paraffins to isoparaffins

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Many other UOP processes are available to the refiner who is seeking ways to improve his operating efficiency and manufacture the kind of products that will bring him maximum market and economic benefits. These processes are available to all refiners. They are described in an informative fully illustrated booklet, "UOP Processes and Products," which will be furnished on request. Write for your copy today. Address:

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More Than Forty Years Of Leadership In Petroleum Refining Technology

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Optimum pressure for vacuum-plant operation

What is the most economical pressure for the operation of a vacuum unit? R.W.T.

Although a single situation was explored in detail on the Questions on Technology page of May 14, 1956, (p. 171), no generalizations appear in the literature. Accordingly computations were undertaken for the nine cases used in plotting Fig. 1, and the nine cases were repeated for barometric outlet water temperatures of 65°, 75°, and 85° F.

Two main factors are involved. As the pressure is increased, the amount of process steam required to reduce the temperature (to a desired vaporizer temperature) increases in almost a linear manner and the increase is only moderately great. The rate of increase of process steam requirements with pressure is substantially the same for all vaporizer temperatures. Obviously, the larger the percentage vaporized, the larger the amount of process steam required. The other factor is the amount of steam required to actuate the steam jet (or jets).

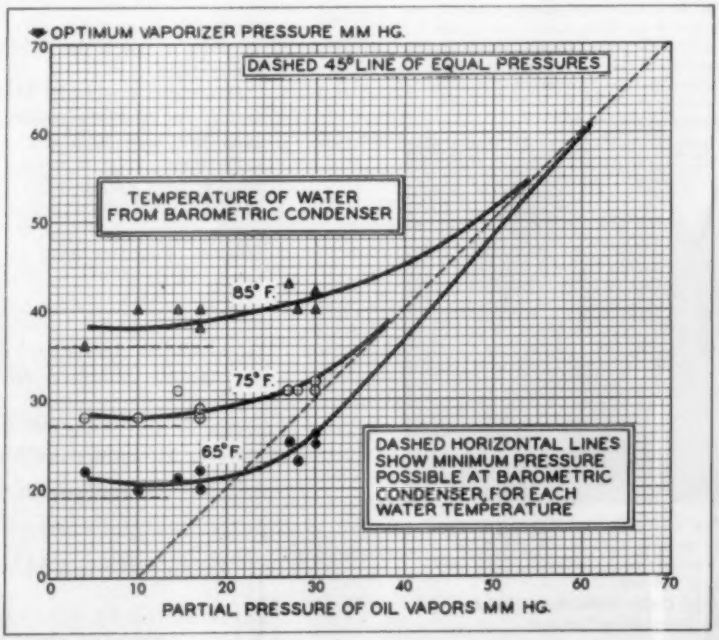
The amount required decreases sharply with an increase in pressure, tending to make the most economical or optimum operating pressure be close to the pressure at which the jet ejector can operate. Thus, the three main factors are: (1) vaporizer temperature, (2) amount vaporized, and (3) the temperature of the water leaving the primary barometric condenser.

Pressure drop between the jets and the vaporizer section seems to have little effect on the optimum operating pressure except to raise or lower it by the amount of the pressure drop. The boiling range of the oil, more particularly whether the oil is high or low boiling, has some effect on the optimum operating pressure as indicated in Fig. 1.

The partial pressure of oil vapors shown on the base scale of Fig. 1 is the pressure required if no process steam is used. It is obtained by noting the pressure required to reduce the actual temperature on the equilibrium flash vaporization curve of the material (for the desired percentage vaporized), to the desired (lower) vaporizer temperature by means of vapor-pressure or boiling-point corrections such as those shown on pages 206-209 of the fourth edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., New York, 1958).

In summary, the most economical or optimum pressure for vacuum-plant operation, i.e., the pressure which requires the least amount of process plus jet steam, can be approximated from the lowest pressure at which the barometric condenser (and jets) can operate with the cooling water that is available. The optimum pressure is higher by the amount of pressure drop encountered in the condensers, line and tower, and in addition by 2 to 7 mm. of mercury as shown in Fig. 1 for the lower pressure ranges.

It is most economical to use no process steam, if the material can be distilled at pressures of 50 or 60 mm. (or higher pressures), and thus no problem about the most economical pressure arises. A high vaporizer temperature (700°-800° F.) tends to slightly increase the optimum pressure (7 to 15 mm.). Fig. 1 is based on a vaporizer temperature of 670° F.



INDICATION of the optimum operating pressure of vacuum plants. Fig. 1.

Cost of Property Taxes and Insurance in Process Cost Estimates

How much is allowed for property taxes and insurance in figuring operating costs?—S.W.T.

No study of this subject has been located in the technical literature. However, the three references listed here employ a total charge of 2 to 2½% per year of the investment cost of the equipment and its buildings. Dybdal states that the insurance part of the cost is only about 0.2% and the property taxes 2%.

References

1. Dybdal, E. C., Engineering and Economic Evaluation of Projects, Chem. Eng. Progress, February 1950, p. 57.
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On the Job

PIPELINING

How to take a sample—and live

IGNORANCE can get a sampler cut, burned, blinded, poisoned, asphyxiated, maimed, or killed.

A good illustration is the story of a new man who, after instructions from a supervisor, went out to sample a diesel tank.

The man's sample cord broke as he was lowering the bottle into the tank. There was a big hatch and ladder on the inside of the tank, so down he went after the bottle, held it under the surface with his hand until it was full, and climbed out with his sample, not knowing how close to eternity he had been until the foreman found out and explained in one-syllable words.

Who would have believed anyone could do such a thing, and how are you going to anticipate it? You can only explain to the inexperienced that oil vapors in any concentration above, at, or below explosibility limits aren't good to breathe and, being heavier than air, can accumulate in any place where volative oils are used and ventilation is poor.

A few danger spots in addition to the insides of tanks are well pits or cellars, deep manifold trenches, or the tops of partly filled floating roof tanks —these can and have accounted for several fatalities.

Probably the most important thing about sampling is knowing when it is safe to secure the sample. Once in a while you are called upon to sample where there is no proper place. There have been attempts made to draw samples off the bottom of flash towers where the oil came out so hot it melted the solder in the can. Why it didn't flash is a mystery.

Hot stuff has to be cooled below its flash point and it is usually possible to bush fittings down to a convenient valve size, so that a copper cooling coil can be hooked up.

The consensus among the gas-plant personnel is that flare fittings for copper tubing are safer than the compression type, but flares will eventually wear thin and tear out under high pressure. This happened to one workman when tubing tore out at the sample end and whipped around like a loose fire hose.

He was spared whatever a wildly lashing piece of metal tubing will do by dropping behind a pipe and crawling to the sample valve to shut it off. He is now a firm believer in renewing flares frequently and will tell you that it is good practice to use new tubing and fittings every time for extreme pressures. Certainly the higher the pressure, the more frequent the renewal should be.

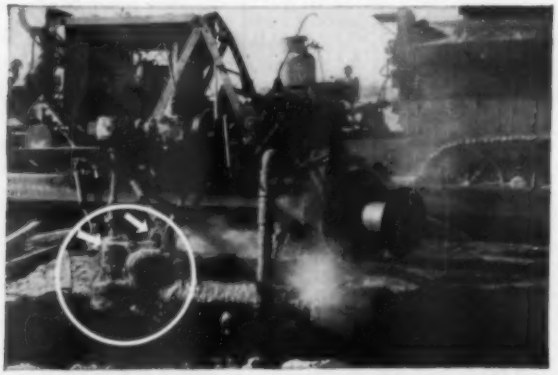
Where gas and natural gasoline samples are taken as a matter of routine a testing procedure for new and old bombs is usually set up by using hydrostatic pressure in excess of the maximum that the bomb will be used for. Where you have to quickly prepare a bomb for a special sample which the boss wants, the best guide for what to use is the AIME pressure piping code.

Hydraulic steel and brass fittings should be used to complete connections for very high pressures. If a long copper tube is needed for sampling at high pressure the sample end should be wrapped around a handy pipe a number of times or otherwise secured in case it does blow off the bomb.

Adapted from article by John Pearson, Mohawk Petroleum Corp., presented before San Jacinto Valley Oil Industry Safety Conference, Bakersfield, Calif.

Viking Pumps for Pipeline Dope

Crutcher, Rolfs, Cummings, Houston, Texas—one of the world's largest suppliers of pipeline equipment—tested several well-known makes of pumps to handle pipe coating "dope." All factors considered, they settled on Viking pumps exclusively and use four sizes, heavy duty construction—LV-1115, LV-1113, L124 and KK124. Each machine has two Vikings, one to pump dope from heating kettle under pressure to spray nozzle, and another to pump from catch basin back to kettle. Speeds range up to 550 RPM, temperatures up to 500° F.



Pipeline coating is just one of many rugged job tests where Viking Pumps have proved superior. If you have a pumping problem, we'll welcome your challenge. Call your Viking distributor, or write for Catalog Ct.

Viking Pump Company, Cedar Falls, Iowa, U.S.A.
In Canada, it's "Roto-King" pumps.

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PIPE LINE SURVEYS

Engineering Progress Report
FROM UNION CARBIDE CHEMICALS COMPANY

Prewashing of Refinery Gas Stream Reduces Diethanolamine Fouling

Gas sweetening cost reduced by preventing contamination

Most refinery gas treating plants using diethanolamine to remove hydrogen sulfide have operated for years with little trouble. However, there have been some instances where the solution has rapidly become fouled.

Laboratory analyses and actual field investigations have revealed that the formation of heat-stable salts is frequently a major contributor to solution fouling. Research has further shown that the formation of these salts can often be controlled by prewashing the gas stream. CARBIDE's Technical Service Department has helped achieve maximum operating economy for many ethanolamine users.

THE EXISTENCE OF HEAT-STABLE SALTS

Estimates of diethanolamine losses in treating operations are based on the observation that the solution progressively declines in capacity to accept acid gases. Analytic procedures suggest that the diethanolamine is not being physically lost from the system by leakage, vaporization or entrainment, but is being converted to heat-stable salts. Examination of many used diethanolamine solution samples from customers' plants has confirmed the presence of heat-stable salts of organic acids such as formic and acetic.

$$DEA + HCOOH \longrightarrow DEA \cdot HOOCH$$
$$DEA + CH_3COOH \longrightarrow DEA \cdot HOOCCH_3$$

THE FORMATION OF OTHER SALTS

In some cases, hydrogen cyanide also enters the treating plant in the gas stream and is combined with diethanolamine as a soluble salt in the absorber section, as are carbon dioxide, hydrogen sulfide, and other acidic components. Analyses of used plant solutions has confirmed the presence of ferrocyanides. It appears likely that they are formed by one or both of the following reaction routes.

1. $Fe(HCO_3)_2 + 6\ DEA \cdot HCN \longrightarrow 2DEA \cdot HCO_3 + (DEAH)_4Fe(CN)_6$

2. $Fe + 2H_2O \longrightarrow Fe(OH)_2 + H_2$
$Fe(OH)_2 + 2HCN \longrightarrow Fe(CN)_2 + 2H_2O$
$Fe(CN)_2 + 4HCN \longrightarrow H_4Fe(CN)_6$
$H_4Fe(CN)_6 + 4DEA \longrightarrow (DEAH)_4Fe(CN)_6$

PREVENTION OF SALT FORMATION

It is possible to minimize the contamination of amine solutions from organic acids by prewashing the gas stream with an alkali solution or water.

In an alkali prewash, some of the caustic will be converted quickly to sodium acid sulfide and sodium sulfide (or the corresponding carbonate salts) by the hydrogen sulfide (or carbon dioxide) in the gas. Nevertheless, the solution will still remove formic and acetic acids since these stronger acids will replace the weaker sulfides and carbonates.

Caustic solutions may not be as effective in removing hydrogen cyanide as they are in removing formic and acetic acid from gas streams rich in hydrogen sulfide or carbon dioxide. This is because the sulfides and carbonates replace the weaker cyanides. The high water solubility of hydrogen cyanide (and the relatively low solubilities of hydrogen sulfide and carbon dioxide) makes water washing an alternate method of hydrogen cyanide removal.

Prewashing not only reduces fouling of the diethanolamine but is also beneficial because the contaminants that are removed may sometimes promote corrosion.

FURTHER STUDIES

Union Carbide Chemicals Company is continually engaged in research designed to improve the products and processes of the gas conditioning industry. The results of this research are readily available to the industry from CARBIDE's Technical Service Department. If you would like more information on CARBIDE's Technical Services to the gas treating industry, call our nearest technical representative or write, Union Carbide Chemicals Company, Room 328, Department B, 30 East 42nd Street, New York 17, New York.

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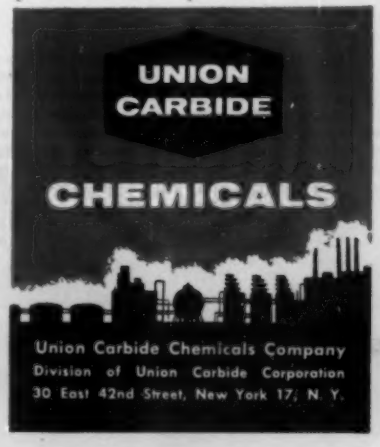

T F

Precision Press Forgings (as well as Hammer Forgings and Extrusions) are made in quantity on a production basis as missile, rocket and engine components, heavy machinery parts, etc. This 64⅜" OD x 1½" wall thickness press-forged stainless steel part is a Heat Sink for a long range missile.

TAYLOR

This 42" OD x 16" long Stainless Steel Jet Engine Turbine Case is representative of products formed by Taylor Forge ring rolling methods. Seamless rings are made in sizes to 120" OD with practically any required section.

Forged Headers with contoured outlets, made with any required outlet arrangement, are widely used for valve settings, gas compressor station manifolds, scraper traps, refinery charge heater headers, and many other applications in gas, oil and process piping. They are also made in heavy wall thicknesses for high pressure-temperature central power station service.

Electric Fusion Welded Pipe is made in sizes from 14" OD to 96" OD with wall thicknesses to 1.531", and in a variety of materials (including stainless and alloy steels). This pipe offers many opportunities for substantial economies, particularly in high pressure-temperature services and also in pipeline river crossings and other applications involving special design requirements. Pipe pictured is 16" OD x 1" wall thickness and is stainless steel.

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Perhaps you think of Taylor Forge only as a maker of highest quality Welding Fittings and Forged Flanges—and certainly they are most important lines with us. But Taylor Forge is also an outstanding producer of many other less widely known though equally essential products.

The few examples pictured here are representative of the many diverse parts made by Taylor Forge to serve American Industry. One thing they have in common is the dependability, the integrity, that has always been associated with the name TAYLOR FORGE.

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General Offices and Works: P. O. Box 485, Chicago 90, Illinois
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District Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Seattle, Toronto, Calgary, Montreal.

Taylor Forge was America's first and is still the foremost manufacturer of Welding Necks, Nozzles, Large Diameter Flanges and similar boiler, heat exchanger and other pressure vessel components. Such parts are made in any size and material for any service condition.

Spiral-Weld Pipe, our original product, (first made as spiral riveted pipe nearly 60 years ago), remains to this day a major item and its use continues to expand. Its money saving features are widely recognized in services such as gas gathering lines; gas, oil and water well casing; irrigation pipe; water piping in sand, gravel and mining operations; and in fact, wherever the use of light weight pipe is indicated. It is also widely used as pipe piling.

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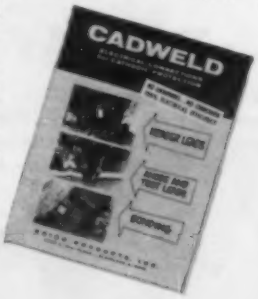
As an example, former equipment for CADWELDING #6 wire and smaller to all horizontal pipes ¾" and larger and flat surfaces cost $45.00. The new equipment cost totals $13.50.

NEW CATALOG on letterhead request



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Sample cocks and fittings frequently become plugged with corrosion products or deposits. This presents a situation that has accounted for many accidents and some fatalities, when someone tried to rod the valve opening out. Tapping small fittings is sometimes successful but cannot always be used. Valves that are used as sampling points for liquefied gases present another danger due to freezing water and plugging with ice. Fires have been caused when leaking gas reached a source of ignition, simply because someone thought he had closed a valve that was merely plugged with ice.

Bombs that are filled by water displacement should have enough water drawn out after filling to insure against hydropressure rupturing the bomb at any temperature at which it might be stored. Where it is necessary to store a bomb full of liquid gas, it should be refrigerated where there is no source of ignition from switches, circulating fans, or lights.

Where many gas samples are used a vent or purge line can be provided where the bomb is connected and grounded while the gas is discharged. Gas escaping through a valve can and does build up enough static to produce a spark hot enough to ignite when conditions are right.

Sampling tanks is a simple procedure as mentioned above, but it can present a few hazards. Light crudes and hydrocarbons can give you a sickening gust of gas in your face when you open the hatch to drop in the sample container. You can get dizzy while getting a sample if you don't get away from rich gas. Where such a condition exists it is up to the supervisor to see that safer ways are provided for sampling. When hydrogen sulfide is present the danger is greater.

Most companies use cotton cord or brass chains for sample lines, but one tried nylon cord because of its strength and resistance to rot. They abandoned nylon when one sampler noticed a spark jump from his hand to the hatch as the cord was sliding through. Nonsparking metals like lead and brass are a must for weights and container holders.

Lean fuels like jet fuel are more liable to present a hazard from static than high-vapor-pressure hydrocarbons, because of tendency to form explosive mixtures. Disastrous fires have been traced to just such combinations. One fatality not long ago is thought to have been caused by a static spark when someone attempted to sample a truck of jet fuel.

If a metal holder and a glass bottle are suspended by a cord you have the makings of a Leyden jar type of condenser—and if it has a charge, the makings of a fire. A metal cage and rod for taking bottle samples could be similarly insulated by the sampler's body from surroundings but probably would not be as good a source of static charges because of the relatively small metal surface exposed. Metal holders and cans (not bottles) on a brass chain or flexible wire grounded to the hatch of the tank or truck would lessen the static hazard.

Asphaltic materials and heavy fuels present something of a problem to the sampler because of their ability to plug sample lines up tight, especially where you depend on pressure to push out the plug. A rigging with a couple of ells in it, on the discharge of a pump can suddenly straighten itself out and spray hot oil when the plug oozes out. Where such possibilities exist, sample lines should be tight and pointed in the right direction.

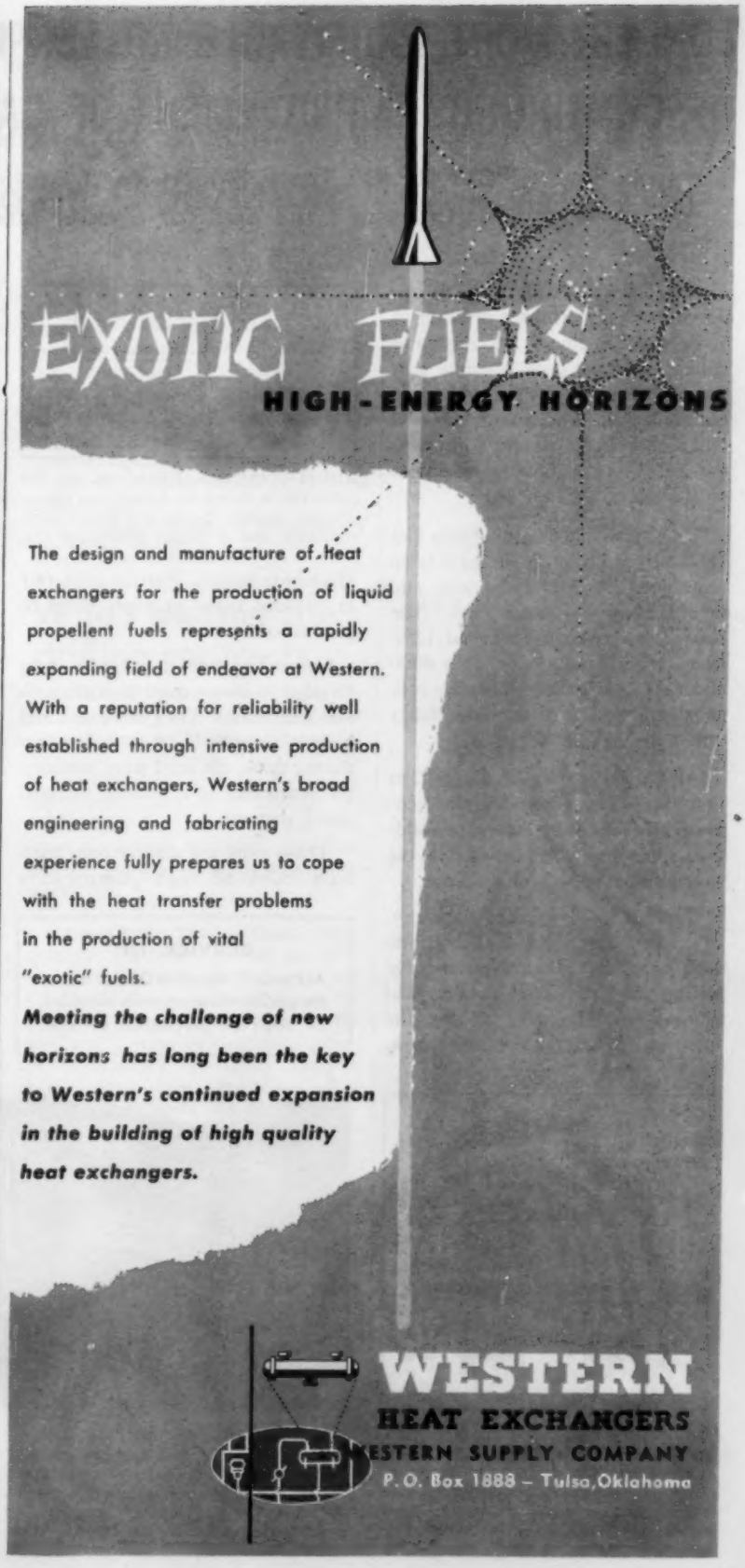
Boiler samples can be dangerous for the inexperienced. Cooling coils are not an absolute necessity for blowdown or condensate samples. You can take a hot sample in glass by raising the temperatures gradually, but use tongs to hold the bottle.

Chemicals of various sorts are being increasingly used in all phases of the petroleum industry, but the old standbys—sulfuric acid and caustic soda—will be with us, with all their attendant hazards, from now on. The handling and sampling of these materials in their fresh and used forms are routine everywhere and people are still getting needlessly burned with both.

Wherever these materials are used, running water should be accessible. Getting concentrated acid on your hands isn't bad if you can wash it off immediately. Getting acid or caustic in the eyes is another matter. You may not be able to wash your eyes fast enough to prevent permanent injury.

Allowing anyone to sample these materials—where any possibility exists of getting it in the eyes—without proper goggles or face masks is grave negligence.

Caustic used to scrub cracked distillates contains cresylic acids. If you get any on you wash it off with water. Don't try to neutralize it. The cresylic acids that will be released burn as bad as the caustic and are not soluble in water so are pretty hard to wash off. Gasoline or alcohol are needed to remove them.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LONGER, MORE PROFITABLE ROLLER LIFE—THE RESULT OF CONTINUOUS IMPROVEMENT OF CATERPILLAR PARTS

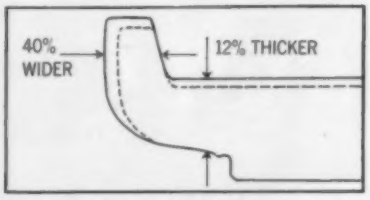
Cat "500" Track Rollers for D8s now have increased rim size for greater strength

A ceaseless search for ways to improve parts performance goes on at Caterpillar. Engineers are constantly striving to make each machine part do its job better, longer and more economically. The payoff for the customer is the steadily improving performance of Cat machines on the job.

New "500" Track Rollers for Cat D8 Tractors, for example, have been redesigned to better resist wear and breakage on the tough jobs. The roller rim has been thickened 12% in its critical area; the flange is 40% wider. The new design prevents roll-over and bending of the outer flange under severe side hill loads.

All Cat roller rims are designed so that treads and flanges may be economically rebuilt by automatic welding—a feature which results in big savings over the life of a tractor.

But that's only part of the story. Matchless Caterpillar quality starts with selection of steel. Extensive testing in Caterpillar metallurgical laboratories eliminates all but the finest quality steel *before* roller manufacturing begins. Further tests (61 in all) are made at every stage of production.



ADDITIONAL MATERIAL on new D8 roller rim is shown by dotted line, above. Thicker, stronger flanges give greater wear resistance and a longer productive life.

Cat roller rims are made from forgings to insure maximum strength and uniformity. They are bored and given a controlled heat treatment producing thick, file-hard wear surfaces; the remainder is left tough to resist shock damage.

These rims are shrunk onto cast-iron hubs of high compressive strength and then center welded. This prevents bore distortion and separation. Automatic precision machines finish-bore the roller assemblies. Careful inspection guarantees uniform quality.

Similar Caterpillar quality is built into track roller bearings and shafts, too. A special bronze alloy is used in Cat bearings to support extra-heavy loads. A cast-iron bushing with high compressive strength encloses the bearing.

There is only one way to get maximum production—the production you paid for—from your equipment. Keep your big, yellow machines on the job by using only constantly improved genuine Cat parts. Your Caterpillar Dealer has full information about the new Cat "500" Track Rollers and all the other quality Caterpillar parts. See him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

SERVICE TIP

Ask your Caterpillar Dealer about the additional economies provided by 500-hour lubrication periods.

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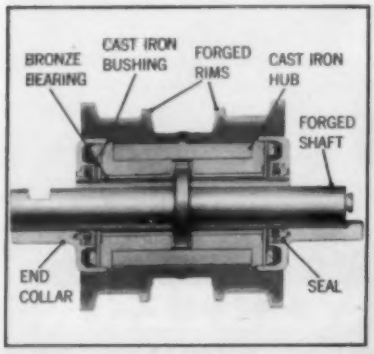

ROLLER CROSS SECTION of Cat "500" Track Roller shows rugged construction. Roller shafts are forged for controlled grain structure, maximum toughness and to permit superior heat treatment. Wear surfaces are hardened to a depth of at least 3/32", leaving a tough, strong core.

TOUGH JOBS, like the one pictured above, play havoc with any but the best track rollers. Here's what happened on an actual job: New Cat rollers were installed on the right side of a tractor; another brand of rollers on the left side. After 668 work hours, seals and bearings of two of the other brand rollers failed. They broke up and were lost from the roller shell. The Cat rollers showed normal wear and the 500-hour lubrication proved its value. Owners everywhere are proving that it pays to standardize on Caterpillar—equipment *and* parts.

Texas Based Drilling Company Expands Canadian Operations

Stekoll Drilling Co., Dallas, is opening engineering and operations offices at Estevan, Saskatchewan, to take care of its expanding Canadian operations. Stekoll land offices have been established at Regina and Calgary.

Charles Johnson, formerly assistant superintendent of Stekoll's shallow operations at Corsicana, Tex., has been made general superintendent.

Assistant superintendent is Jack Zimmell, transferred from Borger, Tex., where he was field engineer and assistant superintendent. Office manager is W. B. Woodall, formerly office manager at Corsicana.

Johnson has been with the company 14 years. Previously, he had been associated with his father as a field engineer in water-flood operations at Independence, Kans.

Zimmell started with the company as a roustabout in 1935. Woodall joined the company in 1950 as the Corsicana office manager.

Stekoll Drilling Co., headed by M. H. Stekoll, has been an independent drilling and producing company in the United States for 32 years. Current Canadian operations center in Saskatchewan and Alberta provinces.

Anderson Joins Calvert

Calvert Drilling, Inc., Olney, Ill., is enlarging its Oklahoma division staff at Oklahoma City, with the addition of S. M. Anderson, Jr., as landman and attorney. Anderson has been an independent operator in Oklahoma and Kansas. He has practiced law in these states since 1946. Calvert is operating 15 rigs in the Mid-Continent area. Horace K. Calvert is vice president in charge at Oklahoma City.

McCown Made Head Of Eason Drilling Division

Drilling operations of T. T. Eason & Co., drilling division of Eason Oil Co., Oklahoma City, are being placed under the direction of Frederic P. McCown, who recently became associated with the company.

McCown comes to the Eason firm from the petroleum department of First National City Bank of New York. Previously, he had been employed by Kaiser Aluminum & Chemical Corp., and Shell Oil Co. in technical and research phases of drilling and production.

He is a graduate of the University of Texas with a degree in petroleum engineering, and holds a master's degree in business administration from Harvard Graduate School of Business Administration.

T. Winston Eason is president of the Eason company.

Who's getting the drilling contracts

C. Burch, Odessa, Tex., contractor, is getting started on a distant wildcat test 20 miles southwest of Holbrook, in southern Navajo County, northwestern Arizona. Drilling is for Navajo Oil Co., of Phoenix, on its fee land in 33-14n-20e. The test, located on the Holbrook anticline, will be carried to the granite about 4,000 ft.

Empire States Drilling Corp., Albuquerque, has contracted for the drilling of a 4,200-ft. exploratory test Chaco Oil Co. is undertaking on the old Red Mountain structure in the southern portion of San Juan basin, in northeastern McKinley County, northwestern New Mexico. Red Mountain structure has been productive from the shallow (500-ft.) Mesaverde-Menefee sand for more than 24 years but the deepest tests so far have been only to 900 to 1,000 ft. The deep test is designated as No. 20-1 Santa Fe Pacific.

Burdett Drilling Co., Houston, has a new contract job in northern Acadia Parish, southern Louisiana. It is a 9,500-ft. wildcat test for Anthony J. Tamborello, also of Houston, at 1 Arnold Ledoux estate, in 37-7s-1w, in the North Ritchie-Eunice area.

Win Hawkins Drilling Co., Houston, has the contract on a new Louisiana offshore drilling operation Hebert J. Schmitz is undertaking. It is in Block 51, West Delta area, in

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the Gulf of Mexico, about 4 miles from the Plaquemines Parish shore line. First test is scheduled to go to 7,100 ft.

Dorris Ballew, Inc., Natchez, has taken on a new deep-drilling job for Plymouth Oil Co. in Greene County, southeastern Mississippi. It will be a 13,500-ft. test to the Lower Cretaceous-Hosston formation at 1 Jackson, in 33-1n-5w. Location is about 10 miles southeast of Leakesville. It is about 15 miles west of the large Citronelle field, in northern Mobile County, Alabama.

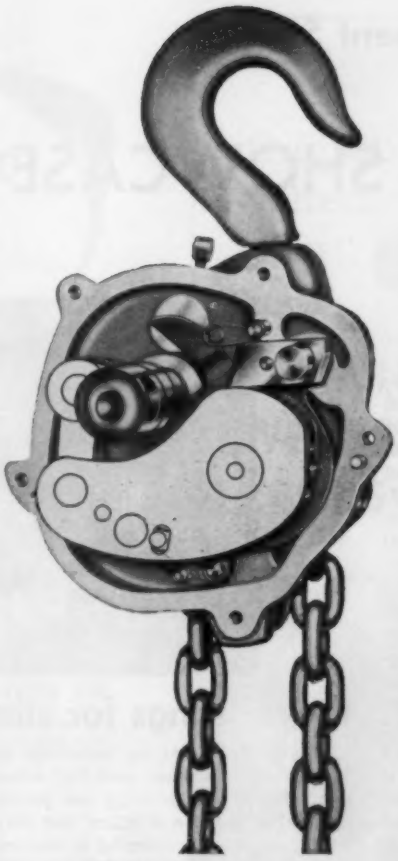
Maxwell Herring Drilling Corp., Tyler, Tex., is moving a rig to the recently opened Mount Vernon field, in eastern Franklin County, East Texas, for a well it has contracted to drill for R. L. Peveto and associates, also of Tyler. It will be the second well for the field, discovered by F. R. Jackson and S. H. Killingsworth with oil production from a 7,000-ft. Pettet sand. Permit for the Peveto well is for 7,200 ft.

Jordan Drilling Co. is well under way on a new 5,600-ft. contract in Anderson County, East Texas. It is drilling for Atlantic Refining Co. Location is 9 miles east of Palestine in the Jane Millander Survey. The test, 1 Langston, is a wildcat with Woodbine sand as the objective.

Viking Drilling Co., San Antonio, has a rig working for Union Producing Co. on a newly started exploratory test in the northwest corner of Goliad County, Central Texas coastal area. Location is near the Bee County line, and about 5½ miles northeast of Pettus. Drilling is set up to go to 8,500 ft. The operation is listed as 80 Ray, with spot location in the large Javiano Gomez Survey.

Inca Drilling Co. has the contract on another deep wildcat test Beck Oil Co. proposes to drill in Lafourche Parish, southeastern Louisiana. The new job, with a permit for 13,500 ft., will be about 3 miles northeast of Rioux field, northeast of Raceland. Inca now has a rig working for Beck on a 13,000-ft. wildcat in the Thibodaux area, about 20 miles northeast, in the same parish. The Rioux area operation is at 1 Dufrene, in 39-15s-19e.

Exeter Drilling Co. is contractor on a new wildcat test Raymond Oil Co. is putting down at 1 Miller, in 29-18n-51w, about 5 miles northeast of Juelfs field, in southwestern Morrill County, in southwestern Nebraska.



New

Compound

Levers

Make Coffing Super Powers the most efficient hoists in their class

Super Power hoists are designed around a new compound leverage principle. The levers, which replace the gears of conventional designs, enable workmen to raise loads with less handle pull than other hoists of the same capacities. Since use of the levers also reduces hoist size and weight, the workmen have 20% less weight to carry to the job.

Available in 1½ and 3 ton capacities in aluminum, and 1½ to 5 tons in malleable iron, Super Powers require little maintenance, since moving parts have sealed-in lubrication. Overload testing, "Safety Valve" handles, and constant load-locking ratchet and pawl assure safe operation. For complete details on these hoists, consult your Coffing distributor, or write to us for Bulletin L-3.

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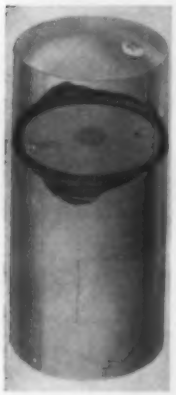
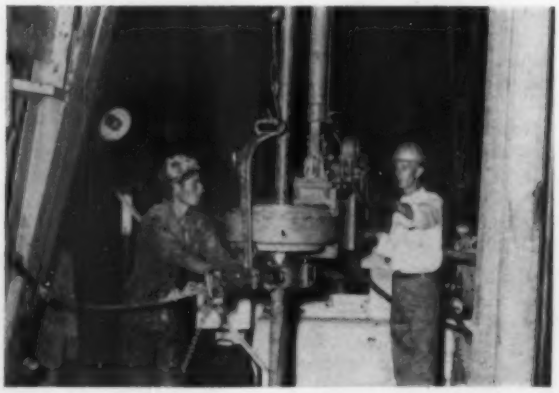
Floating roof cuts evaporation



. . . from small-diameter vertical tanks. Made of rigid foam-plastic, the floating roof is easy to install. Applications include terminal tanks, solvents-storage tanks, and other product-storage tanks up to 20 ft. in diameter. The cover will also retard corrosion and preserve product in field tanks. It is expected to provide the same conservation protection for small tanks that the floating roof has accomplished for large storage tanks. Evaporation, breathing, and filling losses can be reduced at least 90% with the use of the Hamondflote cover, the maker claims. **Write or call: Hammond Iron Works, 630 East Avenue, New York 20, for details on Hamondflote cover.**



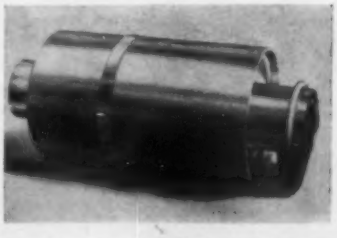
Power tongs for slim-hole drilling

. . . make each joint up uniformly to 1,800 lb.-ft. of torque. And they cause no difficulty in breaking out joints, the maker says. In a recent test they were completely successful in making entire trips on a 6,000-ft. hole, according to the maker.

The Model 54 tongs have a triple-chain drive and a multiple face clutch. Maximum torque in low gear for breakout is 9,000 lb.-ft. High-gear torque ranges from 300 to 2,200-lb.-ft.

The tongs stay on the pipe for the entire trip. A hydraulic lift with an air-chamber cushion moves them up and down. Alternately, a counterweight suspension is available. Optional jaws permit handling 2⅜ to 7-in. pipe. Other models handle up to 10¾-in casing. **Write or call: Foster Cathead Co., Wichita Falls, for details on Model 54 power tong.**

●



Spark arrestor for engines

. . . uses a straight-through exhaust-flow principle and a new cyclonic action that is highly efficient in trapping dangerous incandescent exhaust carbon. Efficiency stays high at all throttle ranges. Back-pressure is low.

Having both inlet and outlet fittings, it can be placed at the end of, or within, an exhaust system. Mounting can be horizontal, vertical, inverted, or at an angle. In most applications, it can replace the muffler and occupy the same space.

The type C Gill spark arrestor comes in sizes to accommodate both gas and diesel engines with up to 9,325-cu.-in. displacement. Exhaust

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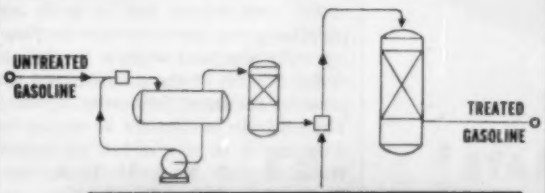

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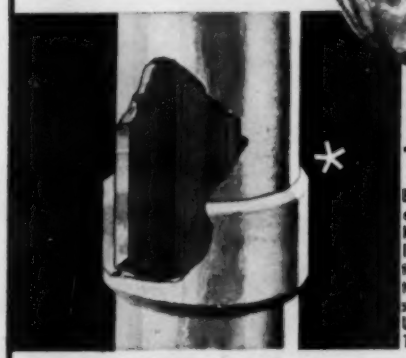

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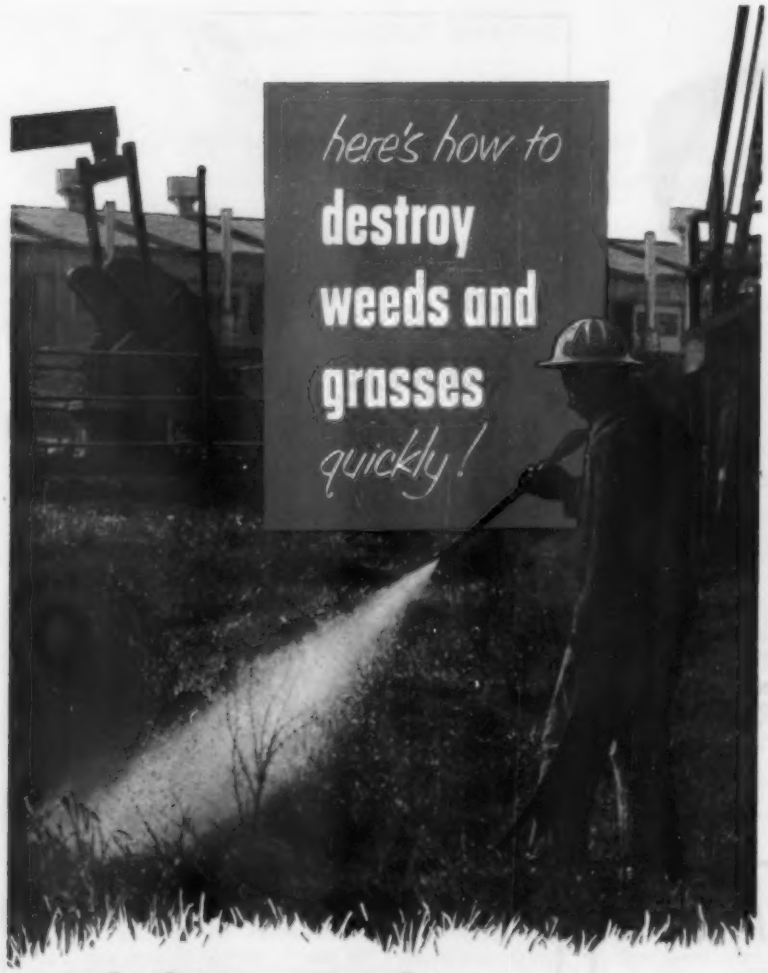

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carbon is retained within the arrestor and dumped periodically through an easily accessible port. **Write or call: Erickson Products Co., 1960 Carroll Avenue, San Francisco 24, for details on Type C Gill spark arrestor.**

●

Paraffin scrapping tool

. . . provides fast, convenient, and safe removal of paraffin in either flowing or dead wells, the maker claims. It's available in standard sizes of 1¼ to 2½ in. Larger sizes are obtainable on special order. The Series 200 K & M paraffin scraper and hole opener consists of two mandrels—one inside the other. Eighteen retractable paraffin-scraping knives are pin-connected to the inner mandrel. When the tool is lowered into the well, the knives are retracted. They're easily extended to a cutting position by a jarring action. If the tool sticks, an upward jar shears a safety pin and allows the knives to retract and the tool to be easily withdrawn.

The tool can be run so as to cut paraffin going down the hole on flowing wells. On dead wells, it can be run to the bottom of the paraffin and the paraffin cut from the bottom upward. The tool can be cleaned as needed by dropping it in to the hot oil below. **Write or call: K & M Tools, Inc., P. O. Box 911, Liberal, Kan., for details on new paraffin-scrapping tool.**

●

Charger-battery combination

. . . can assure positive starting of standby-power engines. The package includes a silicon charger and lead-calcium plate batteries designed to work together as an efficient unit. The power package requires virtually no maintenance. It gives up to 25 years of service, depending on the battery type selected, the maker says.

The package comes complete with a dripproof housing for wall or floor mounting. When coupled to the charger, the lead-calcium batteries require watering no oftener than once a year. The charger performs as a con-

stant-current charger until the battery is nearly recharged—then a constant-voltage characteristic takes command. No manual switching is required. **Write or call: C & D Batteries, Inc., Washington & Cherry Streets, Conshohocken, Pa., for details on charger-battery combination.**

●

Transmitter offers wide range

. . . of frequencies. The new Model AE-260-HM transmitter is a powerful, voice-modulated transmitter designed for long-distance communications under all kinds of conditions. Its comparatively wide frequency range of 2,000 to 5,000 kilocycles permits proper frequency selection for optimum coverage during day or night operating periods, the maker says.

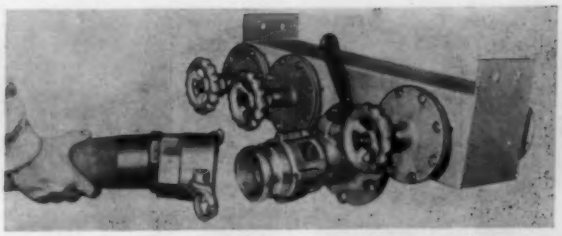
The transmitter features 500 watts input power, single-control band-switching, and nine crystal-controlled channels. Each channel is pretuned, eliminating the need for plug-in coils. All components and assemblies are treated to protect them against moisture, fungus, and corrosion. Three front-panel instruments give visual indication of equipment performance. Full accessibility to the interior chassis is possible through an interlock-protected rear door. The transmitter is suited for use as a base station for point-to-point long-distance communications or for dispatching mobile units. **Write or call: Applied Electronics Co., Inc., 213 East Grand Avenue, San Francisco, for details on Model AE-260-HM transmitter.**

●

Multiple valve simplifies unloading

. . . of trucks and trailers. The valve provides full drainage with no contamination because of the orientation of its Visi-Flow faucet, according to the maker. The faucet is low in elevation and set at a angle to accomplish high-speed unloading.

The faucet is an integral unit bolted to the outlet of the multiple valve. It comes equipped with an adapter outlet or a male-threaded adapter. An operator can tell when a compartment



is emptied in unmetered deliveries by looking through the glass of the faucet. The faucet wrench can be locked open. And it's available with fusible inserts which will close the faucet immediately in the event of fire.

The Wheaton Type 435 multiple valve with Visi-Flow faucet eliminates pipes, flanges, nipples, and gate valves, the maker says. **Write or call: Wheaton Brass Works, Springfield Road, Union, N. J., for details on new multiple valve.**

Smithco pioneered the development of this rugged cooler for severe application. Its functional design, with *excess* cooling capacity, has met and overcome *every challenge* of extreme weather and operating conditions.

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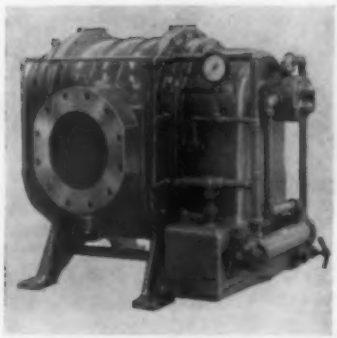

Rotary blower easily piped

. . . through use of horizontal inlet and discharge connections and a vertical impeller arrangement. The new blower uses the Roots rotary positive principle for efficient handling of air and other gas. An improved, segmented-waist impeller shape permits safe, quiet handling of entrained liquids.

All units are sized for direct connection to moderate or high-speed motors. V-belt drives may also be used for intermediate ratings up to about 200 hp. Speeds are well matched to gas or diesel-engine speeds. Steam turbine drives can be used with speed reducers.

Two types of the blower are available—Types RAS and RGS. They have identical volume and pressure ratings. Thirty-six sizes are offered. Capacities range from 2,000 to 14,000 c.f.m. at 6 psig. and 1,500 to 8,000 c.f.m. at 10 psig. **Write or call: Roots-Connersville Blower, Div. of Dresser Industries, 900 West Mount Street, Connersville, Ind., for Bulletin RAS-158.**

Wire line cementing tool

. . . promises higher accuracy in squeeze-cementing operations for either new wells or in remedial operations. The tool allows more predictable results to be obtained than with older types, the maker reports.

To achieve an adequate squeeze-cementing job, a rocket-fuel propellant is utilized. The fuel burns at a retarded rate to create large quantities of gas at a high temperature. A hydraulic hold-down anchor keeps the tool stationary while pressure is applied. The anchor holds at differential pressures in excess of 10,000 psi. The release mechanism used has a positive means of releasing pressure. It equalizes the pressure inside the tool with that of the hydrostatic head in the borehole. This makes tool recovery simple and positive.

According to the maker, tests show the tool is highly effective for sealing off complete sections of perforations, portions of a perforated section, portions of an open-hole section, and channels of communication. **Write or call: Welex, Inc., 1400 East Berry Street, P. O. Box 11336, Fort Worth, Tex., for details on new wire line cementing tool.**

●

Portable horn gives safety warning

. . . for personnel entering chemical and petroleum tanks, tank cars, and other equipment. The new, nonelectric warning horn was developed for use in processing plants. It can be used to assure timely shut-off of pumps and other equipment. Personnel entering confined or dangerous vapor areas set the timing mechanism of the portable unit to a predetermined "safe" period (from a few minutes up). The timer is manually reset as often as required while danger exists.

In the event of incapacitation, a charge of Freon (or other) gas is automatically released to activate a powerful diaphragm horn that instantly alerts personnel over a wide area. A locking device inactivates the unit.

The maker claims the safety device with its own power supply is entirely safe for use in hazardous vapor areas. **Write or call: Falcon Alarm Co., Inc., 243 Broad Street, Summit, N. J., for details on portable warning horn.**

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At the base station, depending on your range of operations, there are two sets to choose from, the 100 watt six channel TR 242, and the 150 watt nine channel TR 222, with frequency ranges of 2-5 mc and 2-6 mc respectively.

For the vehicle, the rugged, shock mounted 50 watt single or dual channel TR 245. It's a lightweight, compact unit with a frequency range of 1.6 to 8 mc. With a low power drain of only 2.5 amps (stand-by on 12 V systems) the TR 245 won't sap your vehicle battery.

For the foot party, a pint-sized roughneck. It's a two watt 23 pound packset, the TR 246, with a frequency range of 2-8 mc.

Wrap up your field communication needs in the Kaar package, the only complete system made. For additional information, write to us:

Illustrated is the 50 watt TR 247. Packed in a rugged fiberglas carrying case, it is ideal for field camp use. Included in the design are provisions for time break circuitry for geophysical exploration data transmission.

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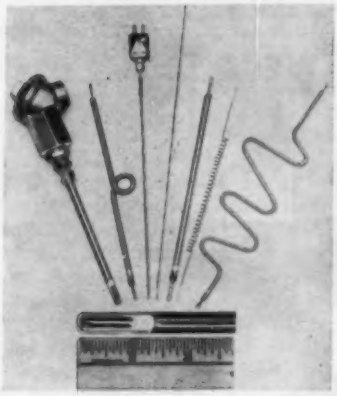
New Equipment



Thermocouple takes 3,000° F.

. . . and corrosive atmospheres. It is small, flexible, and extremely sensitive. The metal-sheathed, ceramic-insulated thermocouple wire is called Cerami-Kouple. It bends on a radius as small as its own diameter without collapsing the metal sheath or shorting the wires. This flexibility plus the small size permits it to reach previously inaccessible "hot spots."

It is a good electrical insulator to 3,000° F., the maker says. Ceramic insulation materials used are magnesium oxide or aluminum oxide. Both have melting points well above application temperatures. Sheath materials include stainless steel, Hastelloy, Inconel, Monel, aluminum, and chromium iron. Continuous lengths in excess of 100 ft. are available. Nominal outer diameters range from 1/25 to 3/8 in. **Write or call: E. C. Smith Mfg. Co., Conshohocken, Pa., for Bulletin GB-8.**

●

Small diesels handle many jobs

. . . and come in a variety of sizes from 6 to 10 b.hp. Made in England, the air-cooled diesels are a four-stroke-cycle type made in two classes.

Class YWA comes in one and two-cylinder sizes with power ratings from 11½ to 24½ hp. Bore and stroke are 4 by 4⅛ in. Class YDA comes in 2, 3, 4, and 6-cylinder sizes with ratings from 38 to 110 b.hp. Bore and stroke are 4⅜ by 5 in.

Principal features of the engines include a Y-type, aluminum-alloy cylinder head designed for efficient cooling. A duct carries air along the entire length of the engine and directs it through spaces between the fins of the cylinder head and barrel. The duct is easy to remove for cleaning.

The Class YDA engine has an axial-flow fan at one end of the duct to aid

in cooling. It is V-belt driven from the crankshaft pulley. The YWA class engine is cooled with centrifugal fan mounted on the flywheel. **Write or call: Ruston & Hornsby, Ltd., Lincoln, England, for details on Classes YWA and YDA diesels.**

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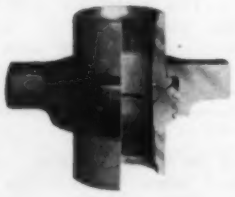

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SHOWCASE . . .

New Literature

Steam turbine generating units

. . . is the title of new 40-page Bulletin 03B7654A. It features design and construction of the WA-series units rated 2,000 through 16,500 kw. It covers four basic types of units designed for condensing, noncondensing, condensing automatic extraction, and noncondensing automatic extraction operation. Turbine construction features are covered. The bulletin reviews manufacturing, testing, unit shipping, and service and erection of the units. Also covered are diagrams of typical instrumentation, tables of standard features and accessories, and a reference table on steam conditions, dimensions, and weights. **Write or call: Allis-Chalmers Mfg. Co., Milwaukee 1, for Bulletin 03B7654A.**

New NEMA-rerated dripproof motors

. . . described in a new folder. They are said to be lighter and smaller than the previous models. Made of cast-iron, the ends may be easily rotated through alternative positions giving four variations in mounting, the folder says. It includes dimensions for all frame sizes and horsepower, synchronous r.p.m. speed, and approximate motor weight. **Write or call: Brook Motor Corp., 3553 West Peterson Avenue, Chicago 45, for dripproof motor folder.**

Heater-unit catalog

. . . includes charts and graphs showing performance characteristics of Nelex heater units. The heaters can be used on piping to maintain the temperature of process fluids and to prevent liquids in the pipes from freezing. The eight-page catalog also features heater installation in concrete structures or slabs for deicing and snow removal. **Write or call: Nelson Electric Mfg. Co., 4041 South Sheridan Road, Tulsa, for Heater Unit catalog.**

Self-locking chert reamer

. . . and the Lub-Seal stabilizer are described in two new four-page bulletins. The chert reamer is milled from a single heat-treated forging and requires no welding. A pin meshes with the top plug to make the selflocking assembly. The stabilizer is designed to stabilize the drill-collar string and maintain a straight hole. The bulletin says it will straighten a crooked hole and relieve shock and impact on drill collars and tool joints. It features lip-seal protection and maximum wall contact. **Write or call: Drilprodco, Inc., 311 North Shipp Street, Hobbs, N. M., for bulletins on chert reamer and stabilizer.**

Water-control equipment Bulletin 314-1

. . . covers in detail meters, rate-indicators, flow recorders, and autometered controls. The comprehensive 20-page booklet shows general specifications and performance details. It features a two-page graph of accuracy and head-loss curves. **Write or call: Sparling Meter Co., 225 North Temple City Boulevard, El Monte, Calif., for Bulletin 314-1.**

Packaged compressor plants

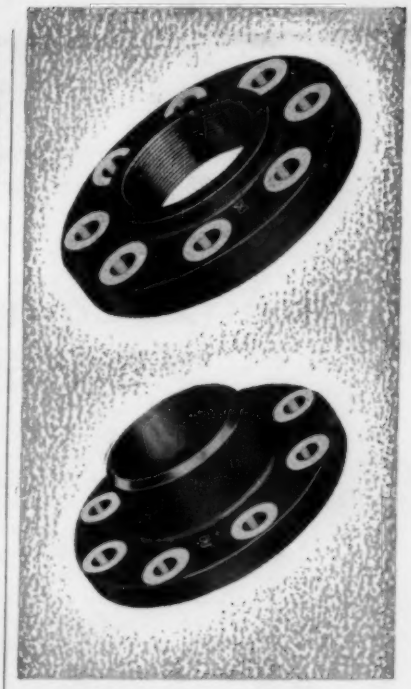
. . . are detailed in a new 12-page bulletin. The compressor plants are adaptable to repressuring, gas-gathering service, gas boosting, conservation, gas-lift operations, pressure maintenance, and gas plants. The engineered components of the plants are illustrated and described. **Write or call: Stearns-Roger, 660 Bannock Street, Denver 17, for Packaged Compressor Plants bulletin.**

Gas turbines

. . . are described in two new bulletins. The Model Mark TA, a 1,150-bhp. gas turbine, is detailed in 28-page Bulletin 162. Cutaway drawings and flow diagrams are included, and typical applications are shown. The second publication is six-page Catalog 163-1 describing Models 302 and 305 gas turbines. These are designed for drive pumps, generators, and centrifugal compressors as well as drying or catalyst regeneration service. **Write or call: Clark Bros. Co., One of the Dresser Industries, 702 Lincoln Avenue, Olean, N. Y., for Bulletin 162 and Catalog 163-1.**

Industrial insulating materials

. . . and their thermal, mechanical, physical, and chemical characteristics are presented in a new 20-page catalog. The catalog includes data on high-temperature spun-mineral-wool insulating block, blankets, pipe coverings, and cements, and on mineral-wool industrial felts and duct insulation. Thermal conductivities and tables of recommended thicknesses of each material are given for appropriate temperature ranges. An insulation-selection chart indicates the temperature ranges of all included types.



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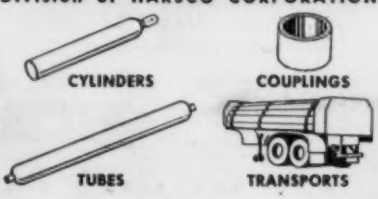

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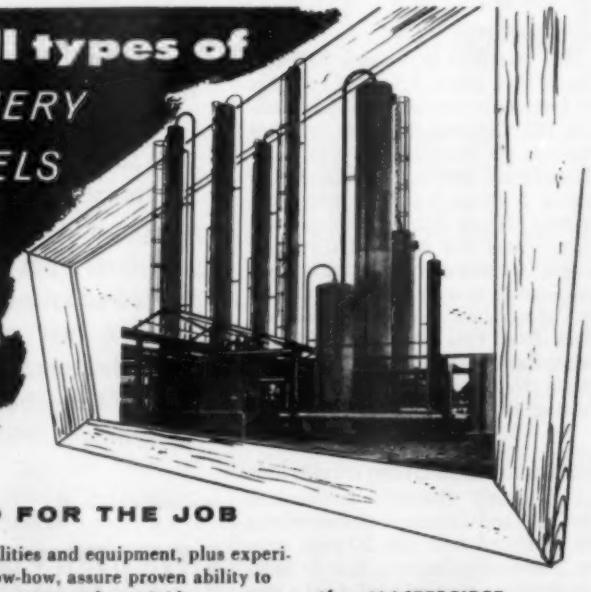

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Write or call: Industrial Insulation Div., Baldwin-Hill Co., 500 Breunig Avenue, Trenton 2, N. J., for Industrial Insulating Materials catalog.

Portable rotary-drilling equipment

. . . is detailed in new Catalog E-270. Features include over-all rig photos and sectional views of individual operating mechanisms. Complete specifications are presented on six standard rotary drills. These include an air-blast unit, a mud fluid rig, and four combination air compressor-mud pump machines. Five drills are truck-mounted and offer the option of power takeoff or separate engine drive. One drill, Model M-8TA, is designed for crawler-tractor mounting. **Write or call: Davey Compressor Co., Kent, Ohio, for Catalog E-270.**

Storage tank and plate fabrication

. . . Catalog 58G describes all types of Hammond-built storage systems. The 36-page booklet includes patented floating tanks, Vaporlift systems, Diaflote tanks, and Dialift systems. It includes underground-storage tanks, water-storage tanks, and treatment vessels, and the Hamondflote cover for small vertical tanks. **Write or call: Hammond Iron Works, 744 Broad Street, Newark 2, for Catalog 58G.**

Sulfur-burning contact process

. . . for the production of sulfuric acid is detailed in new six-page Bulletin 157. The process uses a poisonable vanadium catalyst and predried air for the combustion of sulfur. Spray type of sulfur burners, waste heat boiler and economizer are also used—for acid concentrations from 93 to 109%. Typical flow diagram and step-by-step description of the process are included. **Write or call: Chemical Construction Corp., 1733 Commerce Building, Houston 2, for Bulletin 157.**

Know Your Carburetor

. . . is the title of a new 46-page pocket-size handbook. It describes in nontechnical language just how a carburetor works, with the help of illustrations and diagrams. Common carburetor troubles are outlined with helpful tips on how to correct them. The need for care of the carburetor through regular "on-the-engine" cleaning is emphasized. **Write or call: Pennsylvania Refining Co., 2795 Lisbon Road, Cleveland 4, Ohio, for Know Your Carburetor handbook.**

Sargent Engineering names

W. H. Sargent

. . . W. H. Sargent, vice president, director of oil tool sales, according to E. J. Sargent, chairman of the board, Sargent Engineering Corp. W. H. Sargent has been in charge of the foreign oil tool sales, advertising, and public relations since 1948. He replaces H. L. Sargent.

Gilbert Anderson appointed

. . . to the post of new construction supervisor by National Steel & Shipbuilding Corp. Anderson comes to the San Diego yard from Yarrow's, Ltd. in Victoria, B. C. His first projects at National Steel include the construction of a 5½ million dollar coast and geodetic survey ship followed by Nassco's 24 million dollar C-3 construction program for The American Export Lines.

Oilwell announces

. . . two appointments and transfers, according to M. F. Jones, Gulf Coast area manager of Oil Well Supply Division. J. H. Rudd, Jr., is the new store manager at Morgan City, La., and J. C. Bradley is the new Morgan City field representative. Stuart J. Stein, store manager, and A. L. Crenshaw, field representative, both transfer to Houma, La., from Morgan City.

R. C. Allan — L. L. Leigh — C. A. McCollum — H. C. Tait — C. E. Vandergrift

National Supply Co. reports five changes

. . . in its export division. R. C. Allan, manager of The National Supply Co. of Venezuela, C. A., transfers to the export division in New York City as area sales manager for Europe and Africa. He is succeeded by Lynn L. Leigh. Charles A. McCollum will be area sales manager for the Middle East and Far East. He formerly acted also as area sales manager for Europe and Africa. Howard C. Tait, area sales manager for Venezuela, transfers to Caracas as sales representative of the Venezuelan company. He is succeeded by C. E. Vandergrift.

McCullough Tool Co. announces

. . . changes in its eastern division sales department, according to O. J. McCullough, vice president. Sales representative W. S. Hemphill, formerly in the Victoria, Tex., area, transfers to the Houma, La., location. D. B. Petty, sales representative, transfers from Wewoka, Okla., to the Hominy, Okla., branch office.

Kaiser Steel Corp. opens

R. E. Brown

. . . a sales ofice in Houston headed by Robert E. Brown, reports C. L. Emerson, general sales manager. The new office will provide increased service to the Texas and Gulf Coast markets, formerly served from the company's Tulsa sales office. Brown has been with Kaiser Steel's sales department for 6 years. He was formerly with Carpenter Paper Co.

T. E. Mercer Trucking Co. announces completion

. . . of a new Houston yard and terminal on the San Jacinto River, reports T. G. Mercer, president. W. D. Davis will continue as terminal manager at the new location. Features of the yard include 80 acres of land with 500 ft. of dock space capable of accommodating nine barges at one time; a large new office building; a five-stall garage; a Bucyrus-Erie Co. 38B lifting crane; scales; a parts room; and wash rack.

Paul E. Hilton elected

P. E. Hilton

. . . to the board of directors of Baker Oil Tools, Inc., to fill the vacancy created by the death of R. W. Henderson. Hilton, who will continue as manager of Central division sales and service, Houston, was also elected a vice president. He started with Baker as a serviceman in 1937.

Travis Griffin promoted

. . . to the post of branch manager in Hobbs, N. M., according to S. P. Kroeker, executive vice president of Sivalls Tanks, Inc. Griffin joined Sivalls Tanks in October 1957 and worked in Odessa, Tex., until his transfer to Hobbs early this year. Working with him in the Hobbs

branch is Frank Harrell, sales and service man.

Sales offices reopened

... in Atlanta, Ga., and Tulsa by Midwest Piping Co., Inc., St. Louis, Mo. The Atlanta office is under the direction of John Castleman. The Tulsa office is headed by Claude L. Doughman. Two new sales representatives have joined the Midwest organization, according to P. R. Becker, director of manufacturing sales. They are C. B. Moore and Cecil Hilliard. Both will headquarter in the Houston office.

Gilmour and Nordwall named

... by Crane Co. as general manager of merchandising and general manager of sales, respectively, according to W. O. Brown, vice president for sales. W. B. Gilmour will plan and direct the merchandising of all Crane industrial, plumbing, and heating products and its commercial research and advertising programs. D. R. Nordwall will manage and control the field sales activities, direct the activities of the district managers, and the managers of wholesaler and customer relations.

R. E. Penney, manager of the Los Angeles branch, succeeds Nordwall as district manager. F. C. Akers becomes manager of commercial research and advertising; W. A. Burbine is manager of heating product merchandising; M. F. DuChateau becomes manager of plumbing product merchandising; and C. H. Lovelace is manager of industrial products merchandising.

H. C. Smith announces

... four major promotions within its sales organization, according to A. S. Marshall, vice president, sales of

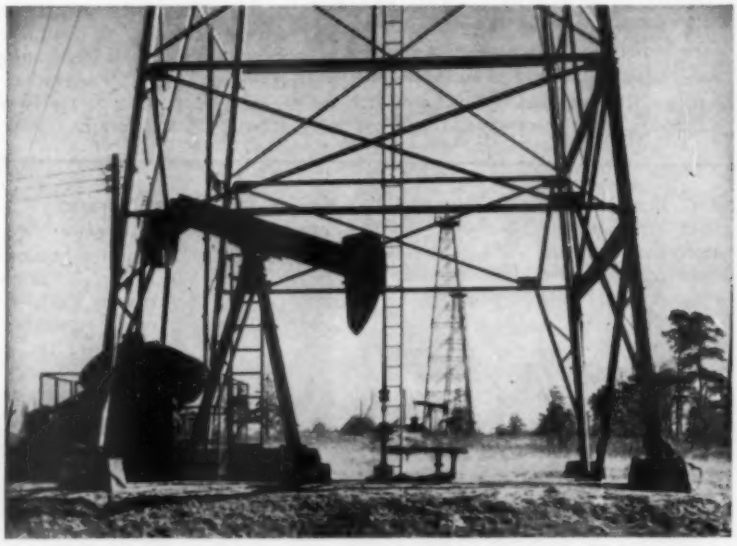
Ed Siever

R. E. Griffin

H. C. Smith Oil Tool Co. Ed Siever has been appointed Mid-Continent sales manager, Odessa, Tex. R. E. Griffin was named southwestern regional sales manager, Odessa. Bill Brandt has been assigned Northwest regional sales manager, Garden City, Kans. Cleve Holt was appointed regional sales manager of the Texas Gulf Coast area.

Bill Brandt

Cleve Holt



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This case history tells how three companies stopped external casing corrosion on 70 of their oil and gas wells in Western Kansas. It was thought that Dakota water was the cause of most of the corrosion.

The companies called on CSI to survey the wells and determine the current requirements for cathodic protection. These ranged from 0.8 to 3.10 amperes. Then CSI was engaged to complete the job.

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Continental-Emsco Co. opens

... a new pump shop in Luling, Tex. The D+B shop will be managed by B. R. Greive, former store manager at McAllen, Tex. L. E. Fullingham is the D+B specialist and the pump shop foreman is W. L. McWhorter.

Bailey Meter Co. appoints

R. T. Cathey

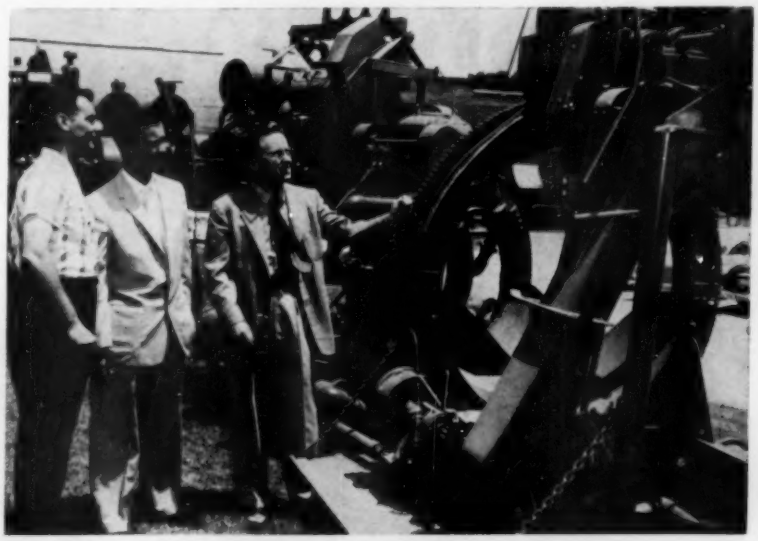
. . . R. T. Cathey as district manager of the Dallas district. He succeeds F. D. Krusemark who has resigned. Cathey joined Bailey Meter as a cadet engineer in 1947 and was assigned to the Charlotte, N. C. district in 1948. In 1955 he became application engineer in the pulp and paper division.

Furniss M. Prell joins

. . . Brown Oil Tools as salesman for metropolitan Houston. He has served with Shell Oil Co. as district superintendent; Hughes Tool Co. as salesman and sales manager. He has also served with A-1 Bit & Tool Co. and Garrett Oil Tools.

Two new sales agents named

. . . for Nelson Electric Manufacturing Co., reports H. A. Norberg, president. William D. Johnson will represent Nelson in Washington, D. C. His primary duties will be closer working relations with the government and industry representatives. E. G. Norton Co., Boston, Mass., has been appointed to represent Nelson in the Boston area. Agents include E. G. Norton and Sydney Morgan. They will serve as consulting engineers to Nelson clients.



Trinidad rep visits M. J. Crose Manufacturing Co., Inc.

Jim Mark, one of the top executives at Linton Mark Contractors, Ltd., Trinidad, B.W.I., recently visited the Crose firm in Tulsa. The Mark firm represents Crose in Trinidad and has also been engaged in pipeline construction and oil field work since 1905. Inspecting Crose pipeline construction equipment are: Bill Handwork, Crose engineer; Mark, and John Manley, export sales manager for Crose.

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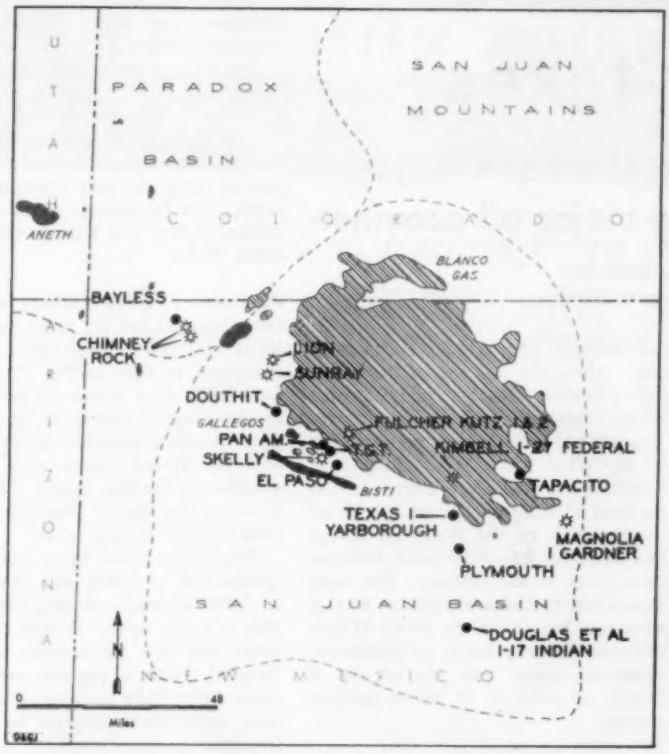

THE FEVERISH exploratory push in the Four Corners region has moved from Utah's Paradox into New Mexico's San Juan basin.

San Juan basin sparks Four Corners buoyancy

BY JOHN C. McCASLIN

THE FOUR CORNERS honors went to northwestern New Mexico's San Juan basin during the first half of 1958. There were 18 new field discoveries in this basin compared to none in Utah's Paradox basin. However, this does not cast any shadow on the Paradox. Development drilling in that basin was at a high pitch with high success ratios reported plus new production records.

San Juan basin exploration was centered in and around the Bisti and Gallegos trends, on the southeast side of Blanco gas field, inside Blanco field itself, on the northwest side of Blanco, and in the Chimney Rock area. The 18 new discoveries in the basin gave this part of New Mexico a 28% success ratio.

Two main objectives featured San Juan drilling—the Gallup and Dakota sands. Small Gallup discoveries dotted the area south and east of Bisti, many of them miles from similar production, illustrating the vast extent of this sand's potential in the basin. Dakota exploration in existing fields and outside of producing areas is coming more and more into its own. Several Dakota producers were opened in Pictured Cliffs and Mesaverde gas fields. This new push to the Dakota appears to be the coming exploratory trend in the basin—deeper gas.

The county-by-county tally of San Juan discoveries follows:

...McKinley County. Douglas Corp. et al 1-17 Indian, NW NW NW 17-19n-5w, flowed 84 bbl. of oil daily from the Mesaverde-Cretaceous.

...Rio Arriba County. Skelly Oil Co. 3 C. W. Roberts in NE SW SE 18-25n-3w, opened Dakota-Tapacito pool. The new pay discovery flowed 171 bbl. of oil per day.

The Texas Co. got Gallup sand production at 1 Yarborough-Federal in SE NW SE 3-23n-6w. The well finaled pumping 47 bbl. of oil daily. Kay Kimbell 1-27 Federal in NW SE NE 27-25n-6w flowed 570 M.c.f. of gas per day from the Chacra. Magnolia Petroleum Co. found Pictured Cliffs-Cretaceous gas production at 1 Gardner-Federal, SE NW NW 5-23n-1w. The well flowed 1,572 M.c.f. of gas daily.

...Sandoval County. A small Gallup sand oil pool was opened in this county at Plymouth Oil Co. 1 Silver in SE NW NE 14-22n-6w. The well pumped 62 bbl. of oil daily.

...San Juan County. There was an even dozen discoveries in this county. New Gallup sand production was opened in Fulcher Kutz field at W. R. Weaver 1 McAdams in NW SE NW 34-27n-10w. The well flowed 9,010 M.c.f. of gas per day. Pan American found Dakota gas production and Gallup oil production at its Gallegos trend well, 1 O. H. Randel in SE NW SW 9-26n-11w. Flow was 5,496 M.c.f. of gas per day and 131 bbl. of oil per day. R. L. Bayless 2 Navajo in C SE NE 5-31n-17w opened Tocito production. Completion was for 37 bbl. of oil daily.

Other Gallup and Dakota successes included: Tennessee Gas Transmission Co. 1 Berger in C NW NE 21-26n-11w. This one flowed 10 bbl. of oil daily from the Gallup; Royal Development Co. 1 Douthit, NW SE SE 33-28n-13w, flowed 106 bbl. daily from the Gallup; El Paso Natural Gas Co. 1 McKee, SE NW NW 1-25n-11w, flowed 4 bbl. of oil daily from the Gallup; Skelly 1 Davis, SW NE NE 26-26n-11w, flowed 1,900 M.c.f. of gas daily from the Dakota and 1,400 M.c.f. from the Gallup; Lion Oil Co. 1 Viersen, C NE NE 19-3n-13w, flowed 6 M.M.c.f. per day from the Dakota; El Paso Natural Gas Products Co. 1 Chimney Rock and El Paso 2 Chimney Rock, SE NE SE 23-31n-17w and C NE NE 15-31n-17w, flowed 1,160 and 2,480 M.c.f.

And Now?

Continued high-level development and exploratory drilling is expected in northwestern New Mexico in the next few months. Particular emphasis will be placed on drilling to the deeper Dakota-Cretaceous sands in search of both oil and gas, in and out of the Blanco trend. Further Gallup oil and gas strikes will pop up along the Bisti and Gallegos trend. One interesting wildcat to watch is a 9,500-ft. Paradox-Pennsylvanian test on Navajo lands west of Verde field. Forest Oil Corp. will put this one down.

Green River basin has what it takes

. . . to increase Rockies gas reserves and to become a major oil province

BY NORMAN S. MORRISEY
Drilling-Development Editor

HUGE STRUCTURES, numerous known pay zones, strat traps, and untapped deeper horizons—all combine to make the Green River basin an attractive exploration area.

Green River basin has all the necessary requisites to blossom out into a major oil and gas province. Along the north rim of the Uinta Mountains, there must lie innumerable untapped structures buried beneath the Tertiary rocks. To the west, the overthrust belt offers the oil finder unlimited spots to stake locations. The other portions of the basin are equally as attractive (see map, p. 34).

Better completion methods and progressive exploration thinking will keep the Green River basin in the forefront as an area of first-class exploration prospects. It could easily become a rival to the Williston basin within the next 10 years.

Spurred by a new gas pipeline outlet, exploration activity in this basin is approaching a new high. There are at least a dozen new exploration units in the planning stage or about to be approved. These pressage an active drilling program within the next year. At the present time most of the drilling activity is in Sublette and Sweetwater counties.

Green River basin covers a huge area in southwestern Wyoming and spills over into extreme northeastern Utah and northwestern Colorado. Mother nature has broken up southwestern Wyoming into several basins, and the Green River is the largest of these units.

Geological exploration here dates back prior to 1868. Lack of outlets, however, and the region's remoteness prevented any active oil or gas exploration until recent years. Today the basin is in the midst of a vigorous exploration campaign, and the outlook for finding large new oil and gas reserves is excellent.

Geology

Tertiary rocks cover nearly the entire Green River basin except along the margins where older rocks crop out. Along the east rim of the basin, the sprawling Rock Springs uplift brings Cretaceous rocks to the surface. The basin is bounded on the northeast by the Wind River Mountains where Precambrian rocks are exposed. On the west side the overthrust belt along the east face of the Wyoming Range has brought Paleozoic and Precambrian rocks to the surface. The east-west trending Uinta Mountains form a structural barrier on the south. Within this vast Tertiary basin are numerous structural units, and oil or gas is found on several of these positive trends.

Uinta Mountains . . . This uplift is an unusual feature of the areal geology of the Rocky Mountains because it trends east-west. Nearly all other structural elements in the Rockies have a northerly trend. On the north flank of the Uintas, Paleozoic formations dip steeply to the north and have been thrust out over younger sediments.

Within these northward-dipping sediments are several possible pay zones that could well be productive within the Green River basin. To date, however, the principal oil or gas reservoirs are either Tertiary or Cretaceous rocks. The Mississippian limestones on the north flank of the Uinta are probably equivalent, at least in part, to the Madison limestone of the Wind River and Big Horn basins. Locally along the outcrop, the Madison has porous zones that will reach a thickness of 150 ft. These zones, under favorable conditions, could be excellent reservoirs.

Another Paleozoic target, not yet exploited, is the Phosphoria. At the moment, this is a primary drilling objective in the Big Horn basin of Wyoming, particularly at Cottonwood Creek where operators are outlining a huge strat trap. At Cottonwood Creek the Phosphoria grades from a porous productive limestone updip into a nonporous section. A similar situation exists in southwestern Wyoming and Utah. Within this area, the Phosphoria strikes approximately east-west and grades in a north-south direction from porous limestones to nonporous facies.

The striking similarities between the Phosphoria producing areas in the Big Horn basin and the potentially productive portions of southwestern Wyoming and northern Utah provide a perfect setup for new Phosphoria oil fields. The Phosphoria eventually will become a lush pay zone in the Green River basin.

Pay zones . . . The Tertiary and Cretaceous rocks are the principal Green River reservoirs at the moment. One exception to this is Tip Top where two wells have found oil production in the Nugget sandstone of Jurassic age. Another possible deeper reservoir, the Weber, could easily become a primary drilling target. To date, however, the Weber (Tensleep equivalent) has failed to produce.

The Green River basin had its first production in 1900, but from 1900 to 1950 sporadic drilling uncovered only a dozen fields. Within the last 8 years, six new fields have been uncovered. With a pipeline outlet, the older fields have undergone an intensive exploitation program in the last 5 years.

At least a half-dozen pay zones within the Green River basin can and do produce locally. Tertiary rocks produce gas for the most part where productive, although oil does occur in these rocks at South Baggs, Hiawatha, LaBarge, Big Piney, and Powder Wash. Within the Cretaceous, Aspen sands produce oil at Aspen and Spring Valley and gas on several of the anticlines. In addition to the Frontier, the Mesaverde is an important oil and gas producer, and also the Dakota.

Big Piney . . . Big Piney is a sprawling strat trap 18 miles long and 3 to 5 miles wide. The field was discovered initially in 1938, but saw little drilling until 1952. Since then operators have developed gas production at a fairly rapid rate, and the producing area now covers more than 13,000 acres.

Big Piney has at least 13 separate Tertiary producing zones, but many of these have only a small producing area. Production is closely related to stratigraphy. The "M" sand, for example, appears to be an offshore bar. The La-Lz sand pinches out to the west of the producing area and reaches a maximum thickness of 112 ft. in one well. The Q and R sands are widespread throughout the field. All of the producing zones of Big Piney are Tertiary or Mesaverde in age. The latter is a new development in the

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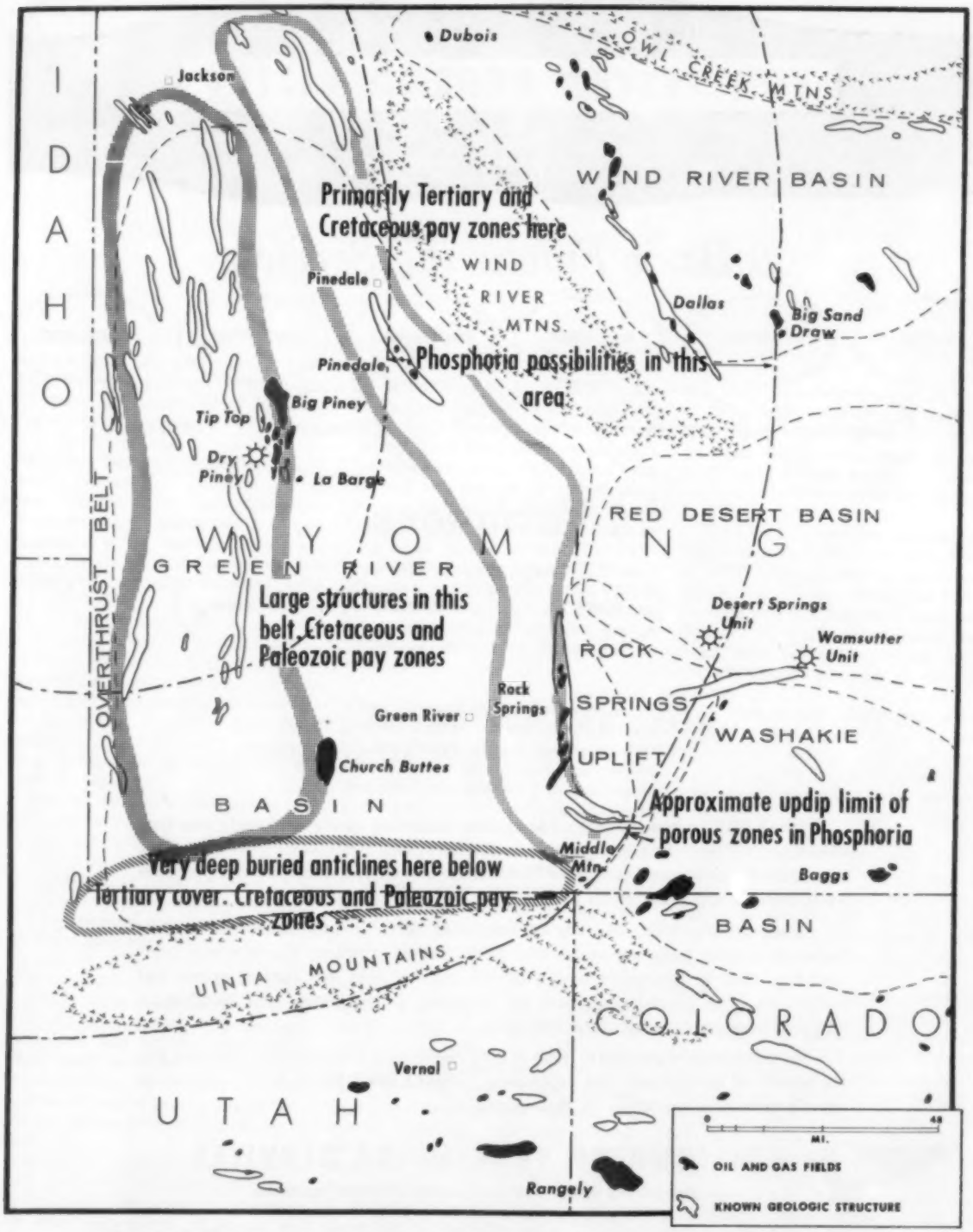

OPERATORS like the looks of the vast oil and gas potential of Wyoming's Green River basin.

field in Section 36-29-113. Surface mapping shows a structural axis to the west of the producing area and the sands pinch out against this uplift. Big Piney is still undergoing an active development program and there are six rigs active.

Pinedale . . . Within the Green River basin, there are several anticlinal prospects that have been mapped either by seismic surveys or surface geological mapping. Pinedale may well be typical of these, although it is too early in the development of this field to determine the limits of production.

Pinedale is a huge structure 45 miles long and 6 miles wide. Present data show that the structure has at least 1,500 ft. of relief. Pinedale lies on the northeast flank of the Green River basin, very close to and nearly

parallel to the Wind River Mountains. Production is from Tertiary and Mesaverde beds. The structure was drilled originally in 1939, but the test was abandoned as noncommercial. In 1955, El Paso Natural Gas Co. and others completed the discovery for an initial potential of 2.4 M.c.f. per day in Tertiary rocks.

Tip Top . . . Along the west side of the Green River basin there are many large surface anticlines, and some of these undoubtedly are thrust-faulted. They owe their origin to the folding that is related to the overthrust belt farther to the west. Tip Top gives a good indication of what this type of structure will harbor in the way of oil and gas reserves.

Tip Top is a surface anticline and a rather unusual one for the Green River basin since it produces oil from the Nugget sandstone. The structure is thrust-faulted, and the Nugget production occurs below the thrust. In addition to the Nugget, Tip Top produces gas from the Frontier, and this production occurs in both the upthrown and downthrown blocks. Present pre-Cretaceous production at Tip Top may well be the clue to future Jurassic and Paleozoic oil and gas fields throughout this entire belt of large anticlines on the west flank of the Green River basin.

Alberta leads Canadian exploration

EXPLORATION NEWS in western Canada was again dominated by Alberta operations as three wells, one in the southern sector of the province and the other two in the central portion, indicated new commercial accumulations of oil and/or gas.

Ferrybank . . . Most encouraging of the strikes was made by two independent Texas operators, J. A. McCarty and C. P. McGaha, attempting their initial joint test in this country. Discovery well is situated 5 miles southeast of the fabulous Dick Lake D3 gas-producing region in Central Alberta, about 30 miles north of Red Deer's city limits. Then venture, 5 Ferrybank, is being drilled on LSD 5, 2-44-28. Scheduled as a Devonian test, the well contained the Mississippian horizon at a favorable elevation and initial drill-stem test in that horizon flowed gas at maximum rate 2,580 M.c.f. daily. A pipe recovery of oil and gas-cut mud was made and following the evaluation coring operations were undertaken and further test is now being run.

Penhold . . . The other Central Alberta discovery was recorded by York Oils, Ltd., at its current exploratory test in the Penhold district, a few miles south of Red Deer. It will be remembered that York discovered commercial oil in the basal quartz in this region some time ago but a ½ mile offset to it did not contain the discovery horizon and that venture was consequently abandoned. The new hole, meanwhile, 2 miles northwest of the original strike, earlier had discovered natural gas in the Viking by flowing at maximum rate 8,800 M.c.f. daily. Most recent test, however, was conducted in the basal quartz zone and 400 ft. of clean oil was recovered. This well is also scheduled as a Devonian test and drilling operations toward that objective have again been resumed.

Cessford . . . Southern Alberta's discovery hole the past week was made by a group of Canadian independents headed by Tidal Petroleums, Ltd., and included Cessland Oil & Gas Corp., Canadian Chieftan Petroleums, Ltd., Resolute Oil & Gas Co., Ltd., and a group of individuals. This venture is situated in the Cessford gas-producing region a little over 100 miles east of Calgary. Although the well is only 1 mile from gas, the fact that an oil flow accompanied the almost assured gas production in the basal Colorado formation, indicated a strike had been made. How thick the oil zone is remains an unanswered question at this time and drilling is again proceeding below the oil and gas horizon to fully evaluate all structures down to and including the Jefferson zone.

Red Earth . . . Red Earth Creek again entered the news as another venture in that area, the ninth by Union Oil Co. of California proved successful at a step-out location. This region of northern Alberta was the scene of one of western Canada's largest land rushes when the operator of the new strike, discovered oil in the granite wash horizon. The new test is 3 miles north of that discovery hole and 1½ miles southeast of the Union 10-1 Red Earth oil success. Three drill-stem tests were conducted in the granite wash and the most encouraging oil recovery, although the water line had been penetrated, occurred on second evaluation when 3,820 ft. of oil was recovered along with a small amount of salt water from the drill-stem. The rig from this venture is now moving to another exploratory test, some 9 miles northeast of the recent indicated success.

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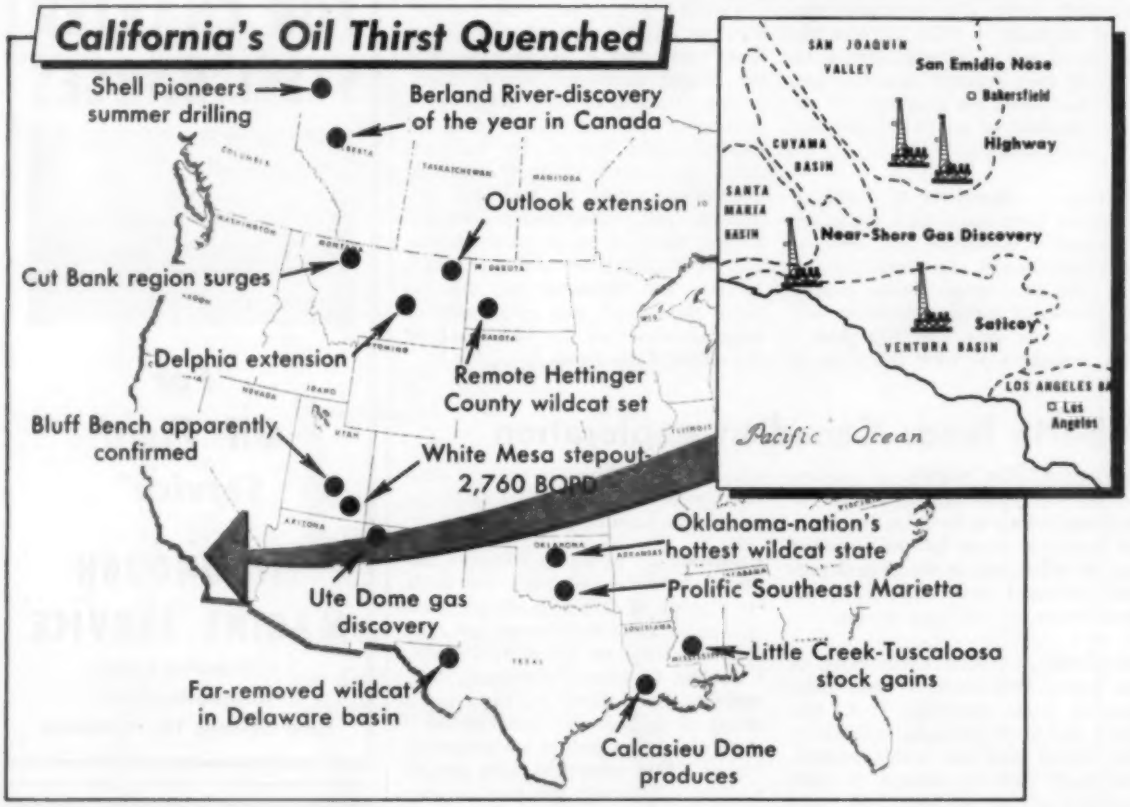

Oil finders meet success from salt-dome finds to deep-reef strikes, but the big news is out west, where

Exploration flares in California

BY JOHN C. McCASLIN
District Editor

CALIFORNIA regained its place on the nation's exploratory success scale in July with four of the most significant discoveries in recent years. Two of the new strikes open a new avenue of exploratory hope in the southern San Joaquin Basin, one of the July finds attracts particular interest because of its proximity to the five offshore parcels which recently drew record cash bonus bids off Santa Barbara County, and the remaining hit proves Ventura's Saticoy field to be even more prolific than previously thought.

The California story . . . Twenty years of expensive geological studies and exploration on the San Emidio nose in Kern County, San Joaquin Valley, California, paid off big stakes to Richfield Oil Corp.

Richfield completed 34-9 KCL "H" on San Emidio ranch property for what is being chanted the most significant find in the state in many a year. Coupled with this strike came the first offset to Highway pool in North Tejon field, 12 miles to the east—all this exploratory success in 1 day.

The San Emidio well flowed 2,520 bbl. of oil per day from upper Miocene Reef Ridge sand at 11,452-11,560 ft. Choked back, the well is now making 265 bbl. per day. The Highway pool offset well flowed 3,124 bbl. per day from perforations at 8,681-9,063 ft.

. . . At Santa Barbara. An important gas discovery 2 miles west of Capitan field in Santa Barbara County, just 3,000 ft. from the Pacific Ocean beach, was completed by Sunray Mid-Continent Oil Co. The 1 Freeman, now shut in, crashed into the California oil news because it is so close to the recently bought five offshore parcels.

. . . In Ventura. Ventura County's big Saticoy field added one of its best wells. Shell Oil Co.'s 7 Saticoy flowed 1,000 bbl. per day on 21/64-in. choke from perforations at 8,728-8,856 ft. —this is better than most of the two dozen wells in the field.

Events in California point to a badly needed reappraisal of the state's tremendous potential as a present and future oil province. The trend of recent years has been to go into old areas and dig up new reserves. The San Joaquin Valley strikes and the promising future of offshore waters may change all this. There's still plenty of oil in the state.

The Regional Story

July wildcat events in the rest of the continent ranged from salt-dome finds to deep-reef finds. Western

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Canada got its most important discovery of the year in a year of superlative strikes, the last remaining piercement-type salt dome known to oil finders in South Louisiana fell to the drill, remote wildcats were staked in the Delaware and Williston basins, northwestern Montana saw new action, Oklahoma became the nation's hottest wildcat province, a prolific offset to White Mesa field in Utah's Paradox basin was completed, Shell Oil Co. began drilling in the Liard River region of MacKenzieland, Mississippi's once-popular Tuscaloosa formation began to rise in renewed importance, Oklahoma's Southeast Marietta field added a big producer, Bluff Bench field in Utah was confirmed, and new extensions were announced in Montana's Outlook and Delphia fields.

In Canada . . . Discovery of Devonian D3 reef gas production at Berland River in Alberta is being hailed the year's discovery of discoveries in the western provinces.

British American Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., cut through 663 gross feet of D3 reef to set a new record for this kind of find. How much of this 663 ft. is pay zone is not yet determined. On drill-stem tests the well flowed up to 27 M.M.c.f. of gas per day. The tests were at 12,016-12,183 ft.

The Berland River reef is the thickest reef yet found, the deepest productive reef, and the deepest production of any kind in Canada. There were commercial gas flows in the D1 zone at 13,000 ft. at Lambert Creek, but this well was plugged.

In Paradox . . . Confirmation and extension work highlighted developments in Utah's big Paradox oil fields. Continental Oil Co. 10 Navajo-B flowed 2,760 bbl. of oil daily to offset a recent White Mesa stepout discovery; Carter Oil Co. finally confirmed the Bluff Bench discovery at its No. 8 well. Oil flowed at the hourly rate of 15 bbl.

In Montana . . . The first good extension discovery in northeastern Montana's Silurian-Ordovician-Devonian Outlook field is Amerada Petroleum Corp.'s 2 Tange. It flowed 100 bbl. of oil per hour from Silurian pay.

Further west on the Montana plains Amerada and Texota extended Amsden production at Delphia field. Oil flow was 20 bbl. per hour from this tricky formation.

A sudden surge of success is reported in northwestern Montana's Cut Bank area. Shell has a Madison discovery in Glacier County; Carter has a Cretaceous stepout strike northwest of Darling field.

In remote areas . . . TXL Oil Co. will drill a remote wildcat in West Texas' Delaware basin. The 15,000-ft. try is 14 miles southwest of Toyah in Reeves County. There is no close production, nor dry holes.

In North Dakota Amerada will go to 8,000 ft. in Hettinger County. This one is 45 miles southeast of production at Rocky Ridge field.

In Oklahoma . . . This is the nation's most successful oil province this year. All sections of Oklahoma report discoveries of importance both geologically and reservewise. The northwest, west, central, east, and south all figure in the wildcat success. One of the big strikes made during July was at Southeast Marietta in Love County. Pasotex Petroleum Co. 1 Brannan flowed 30,500 M.c.f. of gas per day plus 2,531 bbl. of distillate per day from Oil Creek-Ordovician sands to further enhance the feverish deep play in southern and southwestern Oklahoma.

In Mississippi . . . The almost-forgotten Tuscaloosa formation in Mississippi is back on stage in a big way. The scene of this new play is Little Creek field on the Lincoln-Pike County line. There are 17 producing wells in Little Creek. The soaring wave of Lower Cretaceous exploration in southern Mississippi in recent months had almost erased interest in the Tuscaloosa prior to Little Creek.

On salt domes . . . South Louisiana's last remaining dry piercement-type salt dome became wet in July. Hunt Oil Co. opened first production on Calcasieu dome to the tune of 400 bbl. daily. The dome is in Calcasieu Lake, Cameron Parish.

Reserve adds to California discoveries at North Tejon

THREE NEW DISCOVERIES were reported by Reserve Oil & Gas Co. in North Tejon field which it originally found a year ago last March.

The latest Reserve successes are:

. . . A deeper pool discovery in the Vedder Z-5 zone with an offset in the main producing area of the Butler-Wehr portion of the field. This offset, 382-19 BW-T, recovered a net rise of 2,880 ft. of 32.3°-gravity clean oil (320-bbl. daily rate) on a 3-hour formation test of an interval at 12,354-12,527 ft. The other wells in this portion of the field are producing from 11,800-12,000 ft. roughly. This is a south offset.

. . . A new pool discovery about ½ mile south of the main area in a joint venture with Tejon Ranch Co., and Sunray Mid-Continent Oil Co. This well, 385-19 R-S-T, reportedly had an excellent formation test of an Olcese interval around 7,310 ft. Reserve was preparing to wall scrape and complete the well.

. . . A new fault-block discovery with an offset to Richfield Oil Corp.'s Highway area pool activity about 1 mile west of the Butler-Wehr area. Reserve's fault-block find reportedly cored 300 ft. of oil sand around the 10,000-ft. mark. The operator tested 43 ft. of the sand for a 1,000-bbl. daily rate. Richfield's Highway area discovery well just a couple of hundred feet to the west found its pay zone at 9,165-9,557 ft.

With these three latest discoveries, the year-and-a-half-old North Tejon field now has six different productive zones at varying depths from 7,500 to 12,000 ft. plus.

In other areas of the field, Reserve was drilling ahead below 10,000 ft. on a well midway between the Butler-Wehr area and the Highway area, 348-18 B-W, and had a location staked for an eastern extension to the Butler-Wehr area designated 338-17 BW-SP.

Richfield Oil was drilling ahead with two offsets in the Highway area, one to the west and the other a southwest offset.

NEXT WEEK

Eastern Kentucky: A new look at an old area

FIRST QUADRUPLE STRING COMPLETION

Utilizes Brown Hydraulic Set Retrievable Packers

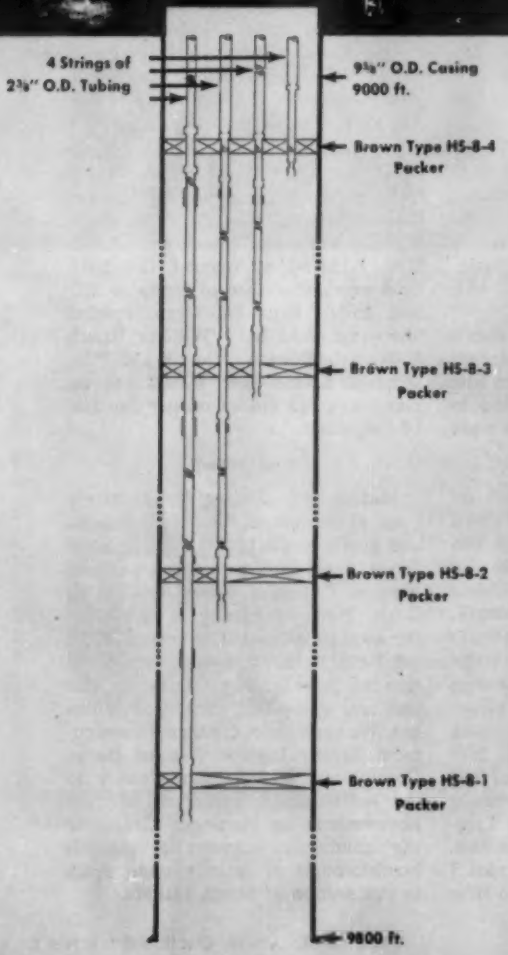
Oil Industry history was made in June of this year when the first quadruple string completion was made in an oil well by the CATC Offshore Group (Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.). The well, the West Delta Block 30 Field, State 970, No. C-8, is located in offshore Plaquemines Parish and is the first well in history to produce four different zones through four individual tubing strings.

Four Brown Hydraulic Set Retrievable Packers were used in the well completion operation and installed by Brown Service Engineers. All four packers were run on the number one string and set in the interval of 9,000 to 9,800 ft. Each packer was set individually and tested from both directions prior to setting the next packer.

Years of research and testing went into the development and manufacture of the HS-8 Series packers. Single and dual Hydraulic Set Packers were successfully used over two years ago. A short time later, after continuous research, the triple string packer was perfected and accepted by the industry. Now, the development of the first quadruple string packer marks another engineering milestone in Brown's long history of firsts.

Brown equipment was used in the first detachable dual string completion, the first detachable triple string completion, and *now*, the first quadruple string completion.

Let "P·R·I·M·E Completions by Brown" save you money. For complete brochure on Hydraulic Set Packers write Brown Oil Tools, Inc., P. O. Box 19236, Houston 24, Texas.


4 Strings of 2⅜" O.D. Tubing
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Brown Type HS-8-4 Packer
Brown Type HS-8-3 Packer
Brown Type HS-8-2 Packer
Brown Type HS-8-1 Packer
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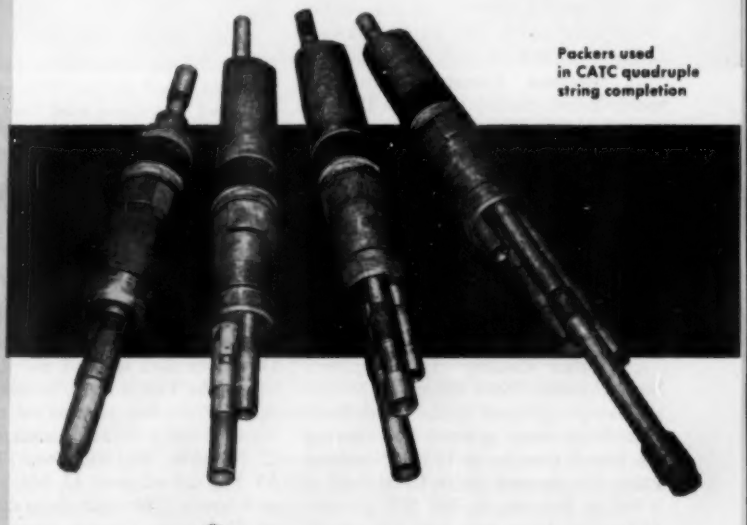

Packers used in CATC quadruple string completion

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In Williston basin

North Dakota scores first-half success

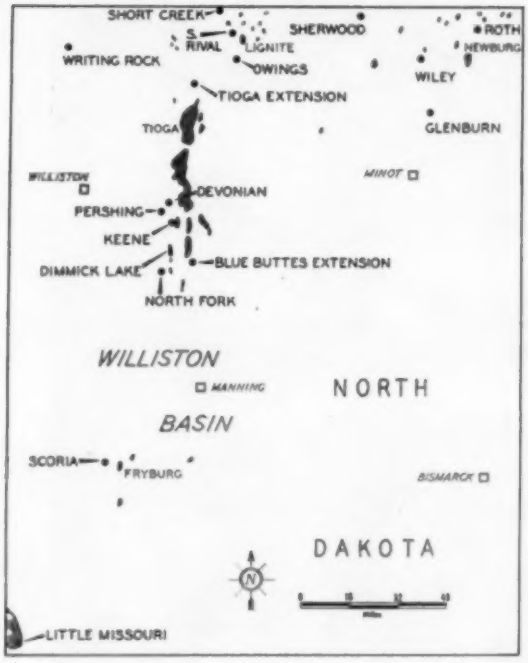
THE NORTH DAKOTA portion of the Williston basin enjoyed its most successful first-half exploratory campaign since Beaver Lodge. Operators in this part of the huge basin opened 17 new producing areas in widely scattered sections of the state—from Bowman County in the far southwest to the Roth area in Bottineau County on the northeast side. Success ratios in the state's big drilling program rose from 9.25 to 26.15%.

Counties figuring in North Dakota success were: Bottineau with two strikes, Bowman with one new pool (first production in county), Burke County with four new fields, Divide with one, McKenzie with six oil finds, and Renville with two. All of these new fields were of the utmost importance to Williston basin exploration. Here is the rundown on the new fields and their discovery wells:

... Billings County. Amerada Petroleum Corp. opened Madison production at Scoria, west of Fryburg and Belfield pools in this southwestern county. The 1 Scoria Unit, C NE NE 10-139n-101w, flowed 188 bbl. of oil per day from the Madison-Mississippian; 140 bbl. of oil per day from the Heath.

... Bowman County. This far southwestern county in North Dakota gained its first oil production at Carter Oil Co.'s 1 Lewis and Allen Johnson wildcat at Little Missouri, C NW SW 9-120n-106w. The Red River Ordovician discovery was completed on pump for 195 bbl. of oil daily and 19 bbl. of water. Location is at the southeast end of the long Cedar Creek anticline, the southwestern limiting feature of the Williston basin.

... Burke County. This northern border county is the busiest of Mississippian playgrounds in the basin. Four new fields were opened here during the first 6 months of 1958. Northern Pump Co. opened South Rival field at 1 W. A. Bywater in NE NE SW 34-163n-92w. Flow was 216 bbl. of oil per day from the Madison. Short Creek field was opened by Northwest Oil Drilling Co. at 1 Bonnie "B," C SE SE 36-164n-93w. Flow was 32 bbl. of oil per day on completion. This is an old well worked over. Pan American Petroleum Corp. 1 Owings, C SE SW 13-161n-92w, pumped 41 bbl. of oil per day to open an unnamed Madison pool. North of Tioga field, Spartan Drilling Co. 1 Thompson extended Tioga Madison production into C SW NW 29-160n-94w. Flow was 210 bbl. daily.



NORTH DAKOTA led the exploratory parade in the Williston basin during the first half—this success is expected to continue during the remainder of 1958.

... Divide County. Writing Rock is the new field opened at a remote location in west-central Divide County by Kerr-McGee Oil Industries, Inc. and Argo Oil Corp. The 1 Arlot Johnson estate, NE NW 34-162n-101w, moved Ordovician production to a key place in the Williston basin. The well was completed for 152 bbl. of oil per day on pump.

... McKenzie County. Half a dozen fields were opened in this Nesson anticline county. It is here that the pre-Madison play is in full swing in North Dakota. Two deep fields were found here. Amerada Petroleum Corp. 1 C. C. Mogen, Tract 1, SW SW SE 10-153n-96w, flowed 85 bbl. of oil per day and 44 bbl. of water to open a Devonian area west of the south end of Beaver Lodge field. Amerada also opened Silurian production at North Fork at the 1 H. H. Shelvik, Tract 1, C NE SW 35-150n 97w. Flow was 19 bbl. of oil and 13 bbl. of water in 6 hours. The other three discoveries in McKenzie County were Madison producers. Amerada opened Dimmick Lake field at 1 Kennedy in C NW NE 29-151n-96w, with a flow of 374 bbl. of oil per day reported. Pershing field was opened at Amerada 1 Ljaadal, Tract 1, C NE NW 29-150n-96w. Flow was 201 bbl. of oil daily plus 7 bbl. water. An extension well to Blue Buttes field was completed by Amerada at 1 Olson in C SE SE 9-150n-95w. Flow was 274 bbl. of oil per day. The Texas Co. extended Keene field at 1 A. Wisness, C SE SW 3-152n-96w. Pump completion was 62 bbl. of oil per day and 12 bbl. water per day.

... Renville County. Two fields were opened in this northern North Dakota County, both in the Mission Canyon-Mississippian. Anschutz Drilling Co. 1 Einer Christensen, C NE NW 7-158n-81w, opened Glenburn field with completion of pump of 205 bbl. daily. Gulf Oil Corp. opened Sherwood field at 1 William Rusch & Nemaha Royalty Co. in the N½ SE NW 3-163n-85w. Production on pump was 245 bbl. of oil per day and 10 bbl. water.

And Now?

Midsummer drilling is relatively quiet at the moment in North Dakota and northeastern Montana. The most active spots are extension wells at Flaxton, Columbis, Scoria, and Tioga fields. New wildcatting is slated for the area 16 miles east of remote Writing Rock field, promising a continuation of pre-Madison interest in this vast and untouched section of Williston. We can expect continued development in the Lignite area of Burke County and in Bottineau County to the northeast. A recent wildcat announcement for Hettinger County in the southwest suggests a possible breakthrough of activity once again in this section of North Dakota.

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A National F-90 Triplex Pump installation in Texas. You can profitably use National Triplex Pumps on a host of oilfield pumping jobs including waterflooding, salt water disposals, and as power-oil sources for subsurface hydraulic pumps.

Only National Triplex Pumps have all 15 of these features!

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1. Connecting rods equipped with steel backed babbitt lined precision bearing shells.
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10. Coordinated design of suction passages, valve areas and end clearances, improving fluid filling and permitting higher speed operations.

11. Lubrication of all power end parts is accomplished by a directed splash system. Deflectors positioned in the power frame direct the splash to built-in reservoirs which in turn deliver oil to the moving parts. (On the F-90 Triplex Pump, a pressure lubrication system, as well as a splash lubrication system, is standard.)

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13. Reversible crankshaft assembly permits direct connected engine drive.

14. Suction and discharge connections arranged for piping from either side of pump.

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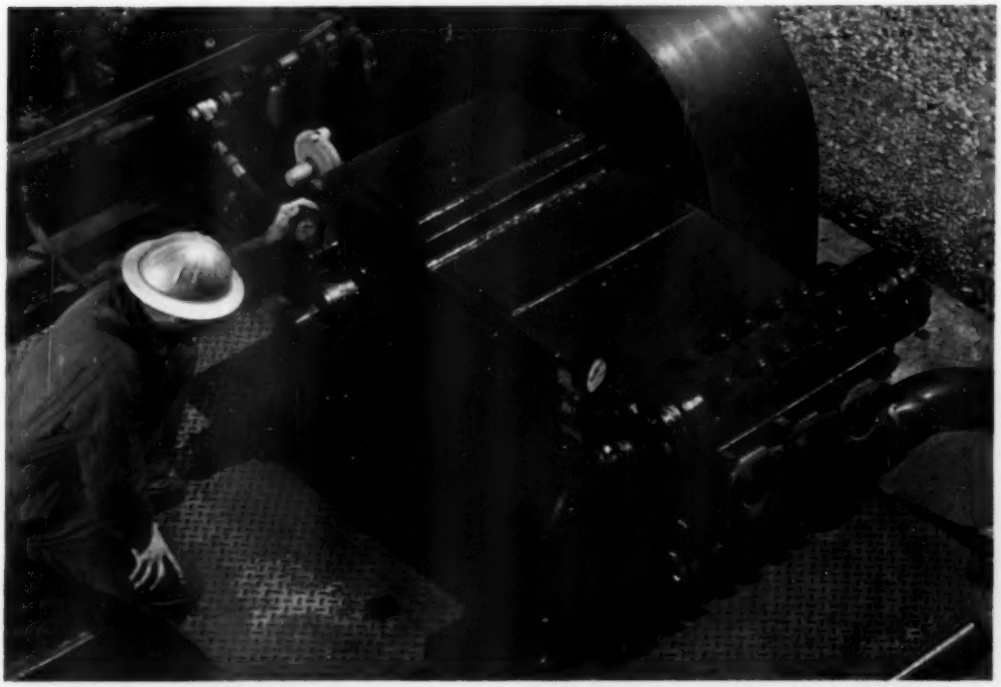

This F-90 Triplex Pump is in use on a pressure maintenance project in Louisiana. The four triplex pumps (F-15, F-30, F-60 and F-90) in the National Line have a rated input hp range of 16.7 to 100 hp, with fluid ends available for high or low pressure, corrosive or non-corrosive service.

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*Patent No. 2,687,229

In northeastern Colorado and western Nebraska

Denver basin sparks healthy drilling spurt

THIS IS REVIVAL YEAR for the Denver basin of northeastern Colorado and western Nebraska. During the first 6 months there were 16 new fields opened in Nebraska; 13 in Colorado. The discovery success ratio in the eastern Colorado portion of the basin rose to nearly 10%—much better than in years past. The Nebraska success ratio was even better —13%.

The Denver basin upsurge appears to be a healthy one. Drilling began to slump here in 1955, was nearly stagnant in 1956, began slow early in 1957, then began to show signs of life later that year. This year drilling in the three-state basin is leading Rocky Mountain development activity. There are no signs at this time of any letdown in this high drilling fever.

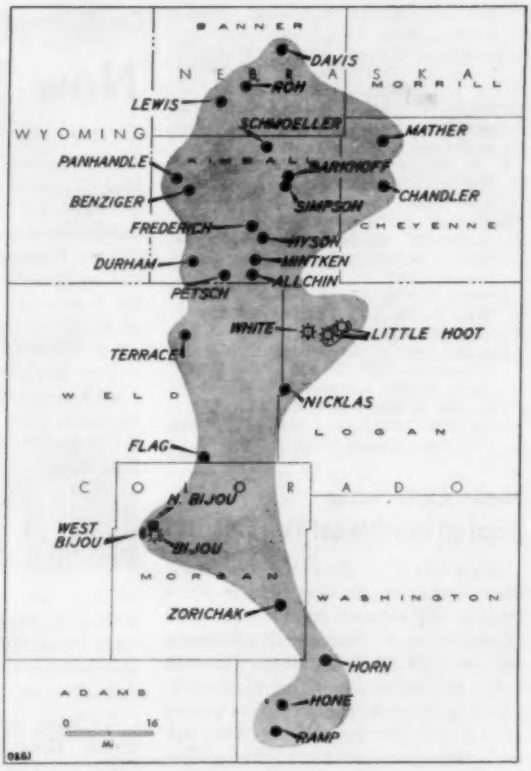
New fields were scattered throughout the basin, mainly in Kimball and Morgan counties. The most significant new finds were Morgan County, Colorado's Bijou area, and Kimball County, Nebraska's Allchin area.

... Bijou. Williamson-Kissinger 1 Bijou, C NE SW 8-4n-59w, Morgan County, opened the fast-moving program in this area. The "D" sand Dakota-Cretaceous discovery flowed 13,500 M.c.f. of gas per day. This discovery was followed by the 1 Matthews "D" sand oil discovery to the west in C SE NW 12-4n-60w. That one flowed 930 bbl. of oil per day. Later North Bijou was opened at Thames & Turnbull 1 State in C SW NW 5-4n-59w. This "D" sand discovery flowed 960 bbl. of oil daily.

The successful completions at Bijou opened a 20-sq. mile area to development. There are no definite limits to the producing area of the fields outlined as yet. Drilling continues unabated despite some dry holes.

... Allchin. The big Nebraska discovery area is at Allchin, just north of the state line in Kimball County. British-American Oil Producing Co. 1 Allchin, C SE SE 10-12n-56w, the field discovery well, flowed 940 bbl. of oil daily from the Dakota "J" sand. Subsequent development work in the field turned up some more big wells.

... Other areas. Other important Denver basin developments included the new gas production tapped in Logan County's Little Hoot area by British-American, Skelly Oil Co.'s White field gas discovery in Logan, the discovery of Zorichak field in Morgan County, and Weld County's new Flag field discovery in the "D" sand. Kimball County's total successful wildcat count was the highest in the basin at 10.



NEW discoveries and new locations planned and under way make the Denver basin the hottest drilling spot in the Rockies this summer.

Here is the completion data on Denver basin discoveries:

COLORADO

Logan County: British-American 1 Fogale, C NW SE 35-11n-54w. IP 3,998 M.c.f. of gas daily from "B" sand; 2 M.M.c.f. from "J" sand. (Opens Little Hoot area.

British-American 1 Monroe "M," C SE NW 9-10n-54w. IP 1,800 M.c.f. of gas per day, "D" sand. (Opens Little Hoot area.

Skelly Oil Co. 1 Osborn, C SE NE 2-10n-55w. IP 5,700 M.c.f. of gas per day, "J" sand. (Opens White field.)

Tom Vessels, Jr., et al 1 Nicklas, C NW NW 30-9n-55w. IP 45 BOPD, "J" sand. Discovery.

Morgan County: Williamson-Kissinger 1 Bijou, C NE SW 8-4n-59w. IP 13,500 M.c.f. of gas per day, "D" sand. (Opens Bijou field).

1 Matthews, C SE NW 12-4n-60w. IPF 930 BOPD, "D" sand. (Opens West Bijou field).

Plains Exploration Co. 1 Hogsett-McLagan, C NW NE 21-2n-55w. IP 318 BOPD, "D" sand. (Opens Zorichak field).

Thames & Turnbull 1 State, C SW NW 5-4n-59w. IPF 960 BOPD, "D" sand. (Opens North Bijou field).

Washington County: Dawson Oil Co. et al 1 State 25-16, C NW NW 16-2s-55w. IPP 156 BOPD, "J" sand. (Opens Hone field).

Dawson 1 Jolly-358, SW SW NW 8-3s-55w. IPP 120 BOPD, "J" sand (Opens Ramp field).

W. C. McBride 1 Ruth Horn "B," C NE SW 34-1n-54w. IPP 150 BOPD, "J" sand. (Opens Horn field).

Weld County: Stuarco Oil 1 Dickerson, C SE NE 18-6n-66w. IPP 20 BOPD, Sussex. (Opens Antelope field).

Stuarco et al 1 Doll, C NW NW 35-7n-58w. IPF 320 BOPD, "D" sand. (Opens Flag pool).

O'Dell Oil Co. 1 Nelson, C NE NE 12-19n-59w. IPP 62 BO 19 hours, "D" sand. (Opens Terrace field).

NEBRASKA

Banner County: Davis Oil Co. 1 Olsen, C SE SW 15-19n-55w. IPP 69 BO 19 hours, "D" sand. (Opens Davis field).

Lewis et al 1 Johnson, C NE NW 30-18n-56w. IPP 175 BOPD, "J" sand. (Opens Lewis field).

Roh Oil Co. 1 Van Pelt, C NE NW 24-18n-56w. IPP 79¼ BOPD, "J" sand. (Opens Roh field).

Cheyenne County: Chandler & Simpson 1 Wilson, SW SW NW 19-15n-51w. IPP 130 BOPD, "J" sand. (Opens Chandler field).

Raymond Oil Co. 1 Mather, C SW SE 1-16n-52w. IPP 200 BOPD, "J" sand. (Opens Mather field).

Kimball County: B. A. 1 Allchin, C SE SE 10-12n-56w. IPF 940 BOPD, "J" sand. (Opens Allchin field).

Tom Vessels 1 Barkhoff, C NW NW 12-15n-55w. IPP 140 BOPD, "J" sand. (Opens Barkhoff field).

Wyoming Western Oil Co. 1 Benziger "A," C NW NE 1-14n-58w. IPP 240 BOPD, "J" sand. (Opens Benziger field).

Shell 1 State-881, C SE NE 12-12n-58w.

IPF 492 BOPD, "D" sand. (Opens Durham field).

Shoreline Petroleum Co. 1 Frederick, C SE NE 31-14n-55w. IPP 200 BOPD, "J" sand. (Opens Frederick field).

3 Hyson, C SW NE 5-13n-55w. IPP 40 BOPD, "J" sand. (New pay discovery at Hyson).

B. A. Mintken, C NE NE 2-12n-56w. IPP 226 BOPD, "J" sand. (Opens Mintken field).

O'Donnell & Edmondson 1-35 UPRR-Panhandle, SE NW NW 35-15n-58w. IPP 65 BOPD, "J" sand. (Opens Panhandle field).

Braden Drilling Co. 1 Petsch, N½ NE NW 20-12n-56w. IPF 293 BOPD, "J" sand. (Opens Petsch field).

Petroleu, Inc., 1 Schmoeller, C NW NE 17-16n-55w. IPP 190 BO 20 hours, "D" sand. (Opens Schmoeller field).

Chandler & Simpson 1 Rodman "G," C SE SW 24-15n-55w. IPP 235 BOPD, "J" sand. (Opens Simpson field).

New California pool at northwest Ten Section

Shell Oil Co. gave the northwest area of the Ten Section field in Kern County its second recent new pool discovery with a successful wildcat in NE NE 23-30s-25e, about ¾ mile from the main area. The Shell well, 84-23 KCL, was completed in a zone at 8,104-8,235 ft. making 446 bbl. daily through a 28/64-in. choke. This well offsets to the west an earlier new field discovery made in this same general area by Shell.

Intex taps new pool at California's Vallecitos

Intex Oil Co. moved to a northwest offset location to an earlier test in the Cedar Flats region of Vallecitos field in San Benito County to tap a new pool at 1,180-1,210 ft. Put on the pump, the well, 2 Cedar Flat-USL, made 52 bbl. of 20°-gravity crude in its first 10 hours on production. This area is about 3 miles northeast of the main Vallecitos field.

California highlights . . . Neaves Petroleum Developments Co. was pondering what to do next with its wildcat in the Half Moon Bay area of San Mateo County in the northern part of the state. Neaves ran electric logs in the 3,163-ft. hole with not too satisfactory results, it is reported. The well site is 1 mile north of old abandoned Half Moon Bay production that dates back to 1867 when surface seepages and shows in water wells encouraged early attempts to find commercial production there.

Standard Oil Co. of California was running tubing to complete a 3,596-ft. wildcat in the Glen Annie area of Santa Barbara County. This wildcat is located 2 miles northeast of Elwood production.

On Central Kansas uplift

New Stafford oil pool opens

A NEW OIL POOL was opened in Stafford County, Kansas, by Sunray Mid-Continent Oil Co. The 1 Cline, NE SW SE 25-24s-13w, is on the Central Kansas uplift.

Two Lansing-Kansas City Pennsylvanian zones proved productive after the hole was drilled to a total depth of 4,160 ft. and 5½-in. casing was set at 3,800 ft.

The higher Lansing-Kansas City zone was topped at 3,549 ft. and perforations were made from 3,698 to 3,704 ft. with four shots per foot. The hole swabbed 2 bbl. of oil an hour. Then the formation was acidized with 1,000 gal. of acid and the well flowed 120 bbl. of oil in 1½ hours through 5½-in. casing after the load oil had been recovered.

The operator perforated the hole's second pay zone, also the Lansing-Kansas City, at 3,594 to 3,597 ft., with four shots per foot, and ran tubing which was set at 3,590 ft. The second zone flowed 40 bbl. of oil an hour for 3 hours through tubing and gaged 200,000 cu. ft. of gas. The well was shut in for tank-room.

Sunray's wildcat producer is on a 480-acre block. Closest production is 2 miles west in St. John field.

Here's roundup of New York wildcats

HERE are the important wildcats drilled in New York State in 1957: This list is keyed to the map which appeared in The Oil and Gas Journal's July 28 issue on page 270.

1. Swan Bell Oil Co. 1 J. Smith,, Cuba Township, Allegany County. Dry. TD 3,977 ft.

2. Swan Bell 1 Torry, Cuba Township, Allegany County. Dry. TD 4,092 ft.

3. Dellwood Oil Co. 1 De Wolfe and McDowell, Carrollton Township, Cattaraugus County. Dry. TD 4,469 ft.

4. Felmont Oil Corp. 1 Seneca Nation of Indiana, Carrollton Township, Cattaraugus County. 9,000 M.c.f. of gas per day. TD 3,492 ft.

5. Felmont Oil Corp. 2 Seneca Nation, Carrollton Township, Cattaraugus County. Dry. TD 3,765 ft.

6. Felmont 1 J. B. Veach et al, Elko Township, Cattaraugus County. Dry. TD 4,273 ft.

7. New York State Natural Gas Corp. N.Y.S. Conserv. (Area 6) Dept. 1. Great Valley Township, Cattaraugus County. Dry. TD 4,355 ft.

8. Felmont 1 M. F. Brown estate, Hinsdale Township, Cattaraugus County. Dry. TD 4,114 ft.

9. Bentley et al 1 E. Laubacker, Ischua Township, Cattaraugus County. 2,700 M.c.f. of gas per day. TD 3,824 ft.

10. Flanigan et al 1 Earl Zeigler, Red House Township, Cattaraugus County. 5,200 M.c.f. of gas per day. TD 3,979 ft.

11. Scott & O'Dell 1 Howe, Red House Township, Cattaraugus County. Dry. TD 4,293 ft.

12. Lee Minter et al 1 E. Kerry, Red House Township, Cattaraugus County. Dry. TD 4,274 ft.

13. Flanigan et al 1 E. Kerry, Red House Township, Cattaraugus County. Dry. TD 4,278 ft.

14. Felmont 4 L. Lockwood, Red House Township, Cattaraugus County. 10,000 M.c.f. of gas per day. TD 4,339 ft.

15. Pennsylvania Gas Co. 1 A. Neckers, Mina Township, Chautauqua County. Dry. TD 3,813 ft.

16. R. Block et al 1 M. June, Westfield Township, Chautauqua County. Dry. TD 2,344 ft.

17. Sargent & Greenleaf 1 Fee, Krondequoit Township, Monroe County. Dry. TD 3,362 ft.

18. Enos Miller 1 Fee, Arcade Township, Wyoming County. 100 M.c.f. of gas per day. TD 3,365 ft.

19. Morton Salt Co. 14 Fee, Castile Township, Wyoming County. Salt well. TD 2,368 ft.

20. George Drury 1 M. Hale, South Bristol Township, Ontario County. Dry. TD 3,845 ft.

21. George Drury 1 J. H. Yates, Bristol Township, Ontario County. 1 M.M.c.f. of gas per day. TD 2,676 ft.

22. Allegany Producing Co. 1 J. White, Troupsburg Township, Steuben County. Dry. TD 4,930 ft.

23. Donovan & Fralich 3 State of New York, Hornby Township, Steuben County. 1,770 M.c.f. of gas per day. TD 3,344 ft.

24. Felmont et al 1 Belmont Quad., Hartsville Township, Steuben County. Dry. TD 4,777 ft.

25. New York State Natural Gas Corp. 1 Stanley Crisco, Erwin Township, Steuben County. 7,500 M.c.f. of gas per day. TD 3,988 ft.

26. Reserve Gas Co. 1 C. Bontrager, Darien Township, Genesee County. 115 M.c.f. of gas per day. TD 1,361 ft.

H. J. Maxwell to Head CNGA

"A LOT OF GOOD can come from energizing the usual—rather than constantly striving for the spectacular."

This fundamental philosophy has shaped and guided the career of H. J. (Max) Maxwell for more than 35 years in the petroleum industry. And during that time he has moved constantly toward higher responsibility in the Standard Oil Co. of California organization.

Maxwell now is one of two assistant general managers of the producing department of Standard's Western Operations, Inc. He is responsible for natural-gas operations and sales.

Maxwell is a square-shouldered, hearty, kindly executive whose door always is open. His knowledge of natural-gasoline operations has gained for him a wide respect in the industry. He knows the business intimately from the standpoint of a veteran field superintendent who has sweated out numerous front-line problems.

Designing savvy . . . Maxwell joined Standard of California's family following World War I, when he saw service with a battle-tested unit of the A.E.F. in France.

His first job was at a drafting table in an old Pacific Gasoline Co. office at Taft, Calif.

The young oil man quickly showed considerable savvy for design. As a result, he found himself responsible only a few years later for planning and building a charcoal absorption plant which employed a relatively new concept for its day.

Maxwell actually had no formal academic training in engineering or chemistry. But he displayed a natural gift of understanding for the highly specialized science of natural-gasoline production and was rewarded with promotions to superintendencies in Standard's southern and Kettleman Hills districts.

World War II found Maxwell in charge at Kettleman Hills, where manpower shortages posed the big problem. He had to teach some 40 women employes to take over the mechanical operating duties for the war-absent menfolk. Max eased his new feminine helpers into the exacting shiftwork without a hitch and they ran the plant until the emergency subsided.

New horizons . . . Max was transferred to San Francisco 10 years ago to assume new executive responsibilities.

Again he displayed the versatility which gravitated him into such tangent activities as labor negotiations and contracts.

He continued extracurricular activity with the California Natural Gasoline Association, which he had joined in the early 30s. His 25 years of work with the group was rewarded last month when Maxwell was chosen as the 1958 president of the association.

At 60, Illinois-born Maxwell is an enthusiastic deep-sea fisherman whose other major avocation is barbership quartet singing. His wife, three grown children, and six grandchildren share his love of music, which was recently extended by the purchase of a fully equipped electric organ.

At the keyboard of this instrument or at his eleventh-floor desk at 225 Bush Street in San Francisco, Max finds pleasure and stimulation in analyzing the "chord structure" of a problem, then combining just the right elements to achieve harmony of operation.

Personals

A. H. Rowan, chairman of Rowan Oil Co., has been elected a director of Texas Pacific Coal & Oil Co.

C. E. Johnson has been appointed district production superintendent for Phillips Petroleum Co. at Cortez, Colo. **W. J. Woodruff** has been named assistant to Johnson.

Harold W. Sherrod, Roswell, N. M., district geologist for Pan American Petroleum Corp., has been transferred to Oklahoma City. Sherrod was area geologist in Midland, Tex., before going to Roswell in 1954.

Four Jersey Production Research Co. research engineers have been promoted to area engineers. They are **Robert N. Hart, P. M. Ferguson,** and **R. W. Mitchell,** geophysical engineering section, and **J. M. Speers,** technical services section.

James Deshler II, chairman of the executive committee of Minerals & Chemicals Corp. of America, has been elected chairman of the board.

Foster E. Groff, division engineer for Ohio Fuel Gas Co., has been promoted to northern compressor division superintendent. He succeeds **Frank E. O'Leary,** who has retired.

Frank W. Dennis, Dr. Earl L. Whitford, and **Robert E. Wilkin** have been elected senior vice presidents of Hooker Chemical Corp. Hooker has also named **John S. Coey,** eastern sales manager, as vice president, eastern chemical sales. Named to the new management committee were Dennis; Whitford; Wilkin; **R. Lindley Murray,** chairman of the board; **Thomas E. Moffitt,** president; **F. Leonard Bryant,** vice president in charge of production; and **Thomas F. Willers,** vice president, comptroller and treasurer. Moffitt is committee chairman.

E. R. Filley, Jr., Tulsa, division engineer for The Texas Co., has been transferred to Midland, Tex., as division engineer in a new office which will handle operations in the Four Corners area.

Richard H. Sterling, manager of Sun Oil Co.'s Dayton, Ohio, sales district, has been named manager of retail sales for the Middle Atlantic region. **E. Gates Sturgis,** formerly on special assignment at the Middle Atlantic regional sales headquarters in Philadelphia, will succeed Sterling.

Maj. Gen. William M. Creasy, who retires September 1 as chief chemical officer of the U. S. Army, will join Lummus Co., New York, as a vice president. He will be director of the Lummus Engineering Development Center. Creasy is a graduate of the United States Military Academy and holds an advanced degree from Massachusetts Institute of Technology.

Personals

E. F. Battson has retired as vice president and chairman of the executive committee of Continental Oil Co. He will continue as a director of Continental and its affiliate, Continental Carbon Co., and as president of Constock Liquid Methane Corp., another affiliate. Battson joined Continental in 1922. He was elected a vice president in 1948 and general manager of the Rocky Mountain region the following year. He was administrative vice president in Houston before moving to New York in 1953 as vice president and chairman of the executive committee. He has been a director since 1951.

Dr. Robert S. Kirk has been promoted to senior research engineer by California Research Corp. and transferred to La Habra, Calif., from Richmond, Calif.

Harry M. Frank has been elected president and a director of Jade Oil Co. during a reorganization of the company. Jade Oil was merged with interests of Frank, Atlas Building Products Corp., El Paso, Tex.; **J. Roy Derrick,** Midland, Tex., independent; and **Hal Leach,** H & I Investments, Ltd., Denver. Derrick was elected vice president and Texas production manager for Jade. He will head the company's Midland office. Leach was elected vice president and treasurer. **G. A. Holtz** was formerly president of the company. **E. P. Zavetti** was vice president.

H. M. Karr, assistant manager of Shell Oil Co.'s engineering department, has been appointed manager in charge of technology for Shell Pipe Line Corp. in Houston. **H. L. Isham,** assistant chief field engineer, at Shell's Wilmington, Calif., refinery, will succeed Karr. Isham will be succeeded by **S. G. Abbott,** senior engineer at Shell's Anacortes, Wash., refinery. In other changes, **Joseph W. Elger,** senior engineer at the Wilmington refinery, has been transferred to the New York engineering department. **L. Claire Austill,** engineering department, New York, will succeed Elger on the West Coast. **David F. Hart,** assistant manager of the Wilmington distilling department, has been appointed senior technologist in the New York manufacturing-technological department.

James P. Moroney, vice president of Colorado Oil & Gas Corp., has retired. Moroney was vice president of Sinclair Oil & Gas Co. before joining Colorado Oil & Gas.

Robert R. Ritter, district development engineer at Ojai, Calif., for Richfield Oil Corp., has been transferred to Calgary to become division development engineer for Canadian operations.

G. F. Willard has been appointed plant manager of the Muskogee, Okla., division of Callery Chemical Co. Willard joined Callery in 1956 as chief project engineer. He has also been production manager and assistant manager for the company. He was with Great Lakes Chemical Co. and Celanese Corp. of America before joining Callery.

R. F. Darrow, Kansas division production superintendent for Continental Oil Co. in Wichita, has been promoted to assistant manager of production for the Rocky Mountain region. He will headquarter in Denver. Darrow succeeds **Wayne E. Glenn,** recently promoted to manager of the Houston production department for Conoco. Darrow has been with the company since 1933.

J. Theodore Wolfe, president of Baltimore Gas & Electric Co., has been nominated to serve as president of the American Gas Association. Officers will be elected at the AGA's annual convention October 13-15 in Atlantic City, N. J. **Robert W. Otto,** chairman of Laclede Gas Co., is the outgoing president. Others nominated for AGA offices include **Wister H. Ligon,** Nashville Gas Co., first vice president; **L. T. Potter,** Lone Star Gas Co., second vice president; and **Vincent T. Miles,** Long Island Lighting Co., treasurer. Nominees for director are **Eskil I. Bjork,** Peoples Gas Light & Coke Co.; **Everett J. Boothby,** Washington Gas Light Co.; **H. Donald Borger,** Peoples Natural Gas Co.; **Orville S. Carpenter,** Texas Eastern Transmission Corp.; **Marvin Chandler,** Northern Illinois Gas Co.; **Carl E. Cloud,** MidSouth Gas Co.; **Charles H. Gueffroy,** Northwest Natural Gas Co.; **William G. Hamilton, Jr.,** American Meter Co.; **W. J. Harvey,** Public Service Electric & Gas Co.; **Robert A. Hornby,** Pacific Lighting Corp.; **A. W. Johnston,** Boston Gas Co.; **Walter T. Lucking,** Arizona Public Service Co.; **E. Clyde McGraw,** Transcontinental Gas Pipe Line Corp.; **E. A. Norman,** Norman Products Co.; and **Gustav F. Watters,** Niagara Mohawk Power Corp.

ANDERSON

Robert E. Anderson, assistant general representative for Standard-Vacuum Oil Co. in Indonesia, has been appointed general representative. He succeeds **E. W. Berlin,** who will return to White Plains, N. Y., for reassignment. Anderson joined Stanvac in 1936. He had served in other Far Eastern areas before going to Djakarta in 1950 with a Stanvac marketing subsidiary. Berlin has been head of Stanvac activities in Indonesia since 1955. He joined the company in 1929 as an engineer in Indonesia. He was manager of the producing department in New York from 1947 to 1953.

V. C. Scott, assistant manager of The Texas Co.'s Tulsa production division, has been transferred to Houston as assistant to the general manager of Texaco's domestic producing department. **R. E. Wright,** staff engineer in New York, will succeed Scott in Tulsa.

M. H. Dubrow, chief engineer in Continental Oil Co.'s production department, has been promoted to assistant manager of the headquarters production department, a new position. He will continue to headquarter in Houston. Dubrow joined Conoco in 1936. He had been chief petroleum engineer since 1947.

Joseph R. Mares, managing director of Petro-Tex Chemical Corp. of Houston, has resigned to become a consultant with the U. S. Government. He will continue as a consultant with Petro-Tex. **J. J. King,** senior vice president of Tennessee Gas Transmission Co. and a director of Petro-Tex, will succeed Mares as managing director of the company.

W. B. O'Heran, district geologist at Ardmore, Okla., for The Texas Co., has been promoted to assistant division geologist and transferred to Tulsa. O'Heran joined Texaco in 1948. He had been district geologist in Ardmore since 1953. He succeeds **C. S. Boyer,** who recently moved up to Tulsa division geologist. In other changes in Texaco's Oklahoma division, **Robert L. Marshall,** area engineer in Maysville, Okla., has been moved to Tulsa as petroleum engineer in the secondary-recovery section. **Gene F. Clark,** area engineer in Healdton, Okla., has been transferred to Tulsa as petroleum engineer in the reservoir engineering section.

Personals

H. T. Bratcher, production superintendent of Cosden Petroleum Corp.'s eastern division, has been promoted to superintendent of production for the company. Bratcher joined Cosden in 1930.

Richard F. Nelson, senior mechanical engineer in Tulsa for Shell Oil Co., has been transferred to New York on special assignment in the production department.

John E. Bierwirth, president of National Distillers & Chemical Corp., has been elected chairman of the board and chief executive officer. **Roy F. Coppedge, Jr.,** executive vice president, moves up to president.

Langbourne M. Williams, president and chairman of the board of Freeport Sulphur Co., has been elected a director of The Texas Co. Williams joined Freeport Sulphur in 1930 and has been president since 1933. He was named chairman last year.

Dr. Harold F. Morrow, Low & Morrow Consulting Geologists, has moved his offices from Regina to Victoria, B. C. Morrow was chief geologist for Saskatchewan before becoming a consultant.

A. W. Foster, superintendent of gas control for Hope Natural Gas Co., has been named assistant system gas dispatcher for Consolidated Natural Gas Co., the parent company. He will continue to headquarter in Clarksburg, W. Va.

William P. Siard has been named district geologist in Durango, Colo., for Tidewater Oil Co. He succeeds **Paul E. Carlton,** who has been transferred to the company's foreign department. Siard, a graduate of the University of Oklahoma, joined Tidewater in 1957.

B. E. Groenewold, formerly president of Exploration Drilling & Oil Co., Tulsa, has been elected president of Midland Exploration Co. and vice president of Sharp Drilling Co. Midland Exploration has purchased the West Texas rigs of Exploration Drilling.

W. B. Read, dispatching engineer in Ohio Oil Co.'s oil movements department, has been appointed assistant department supervisor. **R. W. Palmer** has been named chief crude-oil dispatcher succeeding **R. W. Barnes,** who retired after 46 years with the company.

Harry Wassal, Havana, Cuba, consulting geologist, has organized Harry Wassal & Associates, a firm which will specialize in a scouting service covering the Caribbean and Central and South American oil countries. The company also will prepare special maps and reports. Wassal formerly was with Gulf Oil Corp.

W. M. (Buck) Horn, Gulf Oil Corp., has been elected president of Montana Oil Scouts Association. Other officers are **R. Kennedy,** Carter Oil Co., vice president; **C. H. Tanner,** Continental Oil Co., treasurer; **R. Evans,** Cities Service Oil Co., secretary; **Steve Tanner,** Mobil Producing Co., recording secretary; and **J. Saviers,** Pan American Petroleum Corp., assistant editor.

COPETAS

Aristotle A. Copetas has moved up from assistant manager to manager of system gas supply for Consolidated Natural Gas Co. He will headquarter in Pittsburgh. Copetas succeeds **J. J. Schmidt,** who was recently elected a vice president of Hope Natural Gas Co., subsidiary of Consolidated. Copetas joined Peoples Natural Gas Co., also a Consolidated subsidiary, in 1939.

N. C. Ginther, formerly a partner in Ginther, Warren & Ginther, Houston producing firm, has opened his own offices in Houston. **W. L. Ginther** and **H. C. Warren** will continue their partnership as Ginther, Warren & Co.

John B. Peri and **William F. Wolff** have been named senior project chemists at the Whiting, Ind., laboratories of Standard Oil Co. (Ind.). **Jack M. Paul** and **William V. Sanders** have been appointed senior project chemical engineers. **John V. Peterson** has been named project automotive engineer.

Philip Oxley, district geologist in New Orleans for Tennessee Gas Transmission Co., has been promoted to district exploration manager at Lafayette, La. **Eugene E. McElvaney,** New Orleans district landman, becomes district exploration manager there. **John T. Velkas,** senior geologist in Lafayette, succeeds Oxley as district geologist in New Orleans.

DEATHS

Milan G. Arthur, 44, chief valuation engineer for Union Oil Co. of California, died July 29 in Fresno, Calif., after a heart attack. A petroleum engineering graduate of the University of California, Berkeley, Arthur joined Union in 1941. He had been active in AIME, API, and other industry and engineering groups. In his memory the Milan G. Arthur Memorial Petroleum Engineering Scholarship Fund is being established at the University of California.

J. B. Hensley, Sr., 71, retired industrial-relations manager for Magnolia Petroleum Co., died July 24 after a heart attack.

Harry A. Tallman, manager of the legal department for Crescent Corp., died July 29 in Tulsa after a heart attack. A graduate of Georgetown University, Tallman was with Amerada Petroleum Corp. and later had a private law practice before joining Crescent (then Deep Rock Oil Corp.) in 1947.

Lester E. Flight, chief dispatcher for Sohio Pipe Line Co., died July 18 in St. Louis after a heart attack. Flight joined Sohio in 1929. He was superintendent of the products pipeline division before becoming chief dispatcher for the company. He was a graduate of Hope College.

Claude A. Mulkin, 74, retired field foreman with United Natural Gas Co., died July 26 in Olean, N. Y. Mulkin retired in 1948 after 46 years with United Natural. He was foreman at Hampton, Pa., field at that time.

Paul J. Hallicy, 61, president and a director of Holly Development Co., Huntington Beach, Calif., died July 26 of a heart attack while on vacation at Jackson Lake, Wyo. He had been with Holly since 1922.

Van Dean Hambright, 57, superintendent for The Texas Co. in Fairfax, Okla., died July 27. He had been with Texaco for 31 years.

LPG has strong summer market

Another 1958 price increase is strong possibility

BY JOHN C. CASPER
Economics Editor

LPG COULD be in short supply this winter. Stocks are down. Supply is limited. And, another winter like the last one would bring a jump in demand. The brighter outlook has brought a firmer summer market.

Let's take a look at inventories. The chart shows propane stocks for the past 2½ years. These are total primary stocks, including underground storage, aboveground inventories at plants and terminals, and LRG stocks at refineries.

At the middle of July, propane stocks were down 115,000,000 gal. from the same date last year. This represents a reduction of a little more than 21%. Total LPG stocks show a cut of 137,000,000 gal., but this total includes some material that will be used as a blend for motor fuel.

Propane stocks were not too high last year even with a total of 616,000,000 gal. on hand at the end of October. The backlog was needed before the winter was over. Stock reductions were about normal for November and December 1957. The big drop came in the first 2 months of 1958.

Stock-Reduction Record

More propane was taken out of storage in January and February of this year than in any similar period in petroleum history. Propane stocks dropped 298,000,000 gal. during January and February and drifted 13,000,000 gal. lower in March. Propane stocks normally start back up in March.

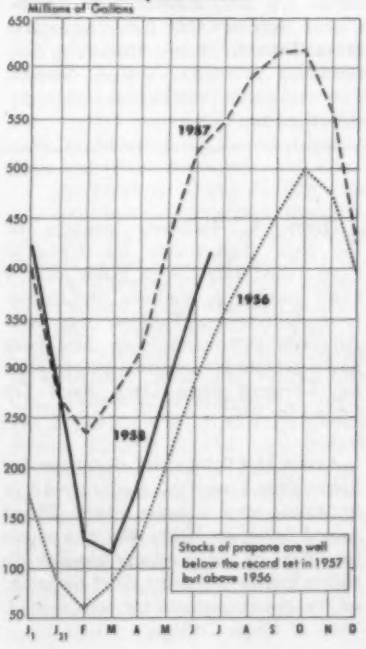
There is little chance that stocks will be up to last year's level by the end of October. At the end of March, propane stocks were down 160,000,000 gal. from the year before. By the middle of July, 45,000,000 gal. of the difference had been made up, leaving 115,000,000 gal. to be gained over the next 3½ months in addition to normal summer and fall increases. Even with higher crude allowables, it will be difficult to add 115,000,000 gal. more to storage than was added last year. Here's why:

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,506,500	DOWN	1,800	DOWN	361,825
Crude stocks	251,720,000	DOWN	1,089,000	DOWN	34,162,000
Completions	906	UP	51	DOWN	175
Refinery runs	7,517,000	UP	67,000	DOWN	246,000
Gasoline stocks	178,808,000	DOWN	748,000	UP	3,110,000
Kerosine stocks	25,338,000	DOWN	293,000	DOWN	5,273,000
Distillate stocks	115,557,000	UP	2,074,000	DOWN	18,265,000
Residual stocks	66,487,000	DOWN	712,000	UP	17,750,000
Four-product stocks	386,190,000	UP	321,000	DOWN	2,678,000
Total imports	1,294,400	DOWN	48,600	DOWN	363,000

Petroleum-product demand in the third quarter can be met with an increase in crude production of only 2.5% over last year. This would not add much LPG from plants operating on casing-head gas. Also, the required rate of refinery runs for the third quarter is a little less than actual for last year. We can't expect any big gain in production of LRG at refineries. These add up to only small gains in propane production in the third quarter.

Propane Stocks

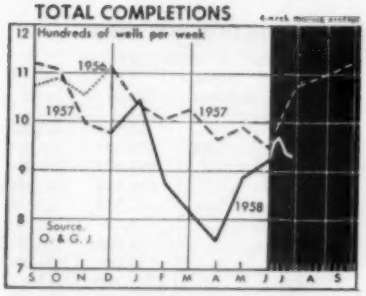


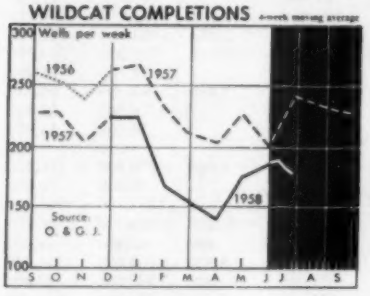
Total LPG Demand Record

Total demand for LPG has topped 600,000 bbl. daily for only 4 months in the past. The first time was in January 1957, but the big demand load came last winter. The average for December, January, and February was 644,000 bbl. daily. The addition of new consuming units since last winter will push demand up to 600,000 bbl. daily even if the weather is a little warmer than last winter.

All these factors have helped create a firm LPG market. The new price for propane and propane-butane mixtures is 5.0 cents a gallon in the Group 3 area, the same as last winter's contract price.

Cold weather in November and December could bring another increase before the end of the year. High demand early in the season promotes spot buying. Jobbers who have to bid high for spot material make the market. Abnormal spot buying can create the shortage that will force higher contract prices.





Active Rotary Rigs*

	7-28-58	7-21-58	7-29-57
Alabama	6	6	2
Arkansas	16	14	23
Arizona	....	....	....
California	77	72	105
Colorado	51	58	51
Florida	....	1	....
Georgia	1	1	....
Idaho	....	....	....
Illinois	33	40	42
Indiana	5	6	6
Iowa	3	3	2
Kansas	131	116	154
Kentucky	6	7	16
Louisiana	290	303	419
North	44	44	53
South	207	215	257
Offshore	39	44	109
Maryland	....	....	....
Michigan	9	10	12
Missouri	1	1	1
Montana	21	16	24
Mississippi	36	31	32
Nebraska	24	23	29
Nevada	....	....	1
New Mexico	104	98	175
New York	2	2	....
North Dakota	32	32	23
Ohio	....	....	1
Oklahoma	184	199	267
Oregon	1	1	1
Pennsylvania	10	10	16
South Dakota	....	....	....
Texas	608	626	897
Gulf Coast	136	128	175
Offshore	1	3	4
West	251	259	350
North	174	198	309
East	46	38	59
Tennessee	....	....	1
Utah	33	37	52
Washington	....	....	1
West Virginia	4	5	5
Wyoming	60	54	82
Virginia	....	....	....
Total U. S.	1,748	1,772	2,440
Western Canada	153	157	189
Eastern Canada	22	2	3
Grand total	1,903	1,931	2,632

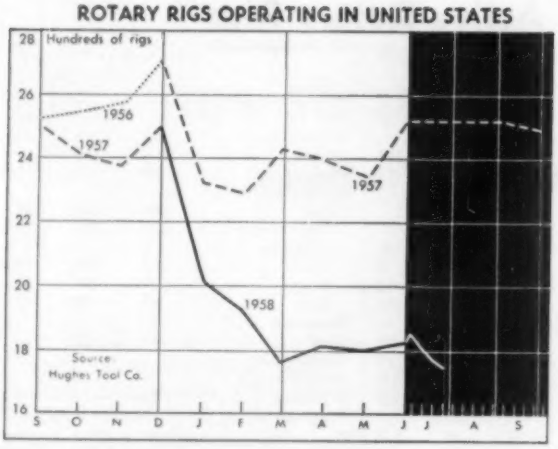
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 26, 1958

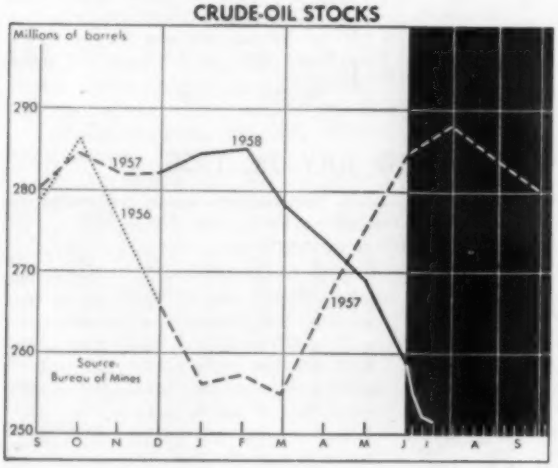
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	42	56	0	0	0	0	0	16	16
Arkansas	15	8	0	0	7	0	54,011	380	606	4	0	0	0	4	96	108
California	27	15	0	0	12	0	145,645	958	1,215	9	3	0	0	6	211	303
Colorado	15	4	0	2	9	0	74,346	430	485	9	0	0	0	9	241	327
Illinois	46	18	0	0	28	0	104,177	1,159	1,375	9	0	0	0	9	230	351
Indiana	17	9	0	0	8	0	29,475	416	340	4	0	0	0	4	151	68
Kansas	78	35	0	2	40	1	267,425	2,108	2,361	16	2	0	0	14	445	472
Kentucky	32	15	0	7	10	0	66,485	599	779	2	0	0	0	2	65	155
Louisiana	57	30	3	2	22	0	391,727	1,886	2,154	4	0	0	0	4	264	388
North	28	15	0	1	12	0	85,699	666	740	1	0	0	0	1	93	99
South	23	10	2	1	10	0	242,646	968	1,002	3	0	0	0	3	155	237
Offshore	6	5	1	0	0	0	63,382	252	412	0	0	0	0	0	16	52
Michigan	20	7	0	1	5	7	55,868	237	227	2	0	0	0	2	78	90
Mississippi	5	1	0	0	4	0	45,243	222	212	3	0	0	0	3	108	111
Montana	4	1	0	0	3	0	22,181	192	219	3	0	0	0	3	85	77
Nebraska	9	3	0	0	6	0	57,787	387	488	3	0	0	0	3	182	275
New Mexico	46	17	1	19	9	0	242,175	1,099	1,195	7	1	0	0	6	147	156
West	23	3	0	18	2	0	100,425	525	460	2	0	0	0	2	62	54
East	23	14	1	1	7	0	141,750	574	735	5	1	0	0	4	85	102
New York	10	5	0	0	0	5	13,500	325	259	0	0	0	0	0	32	2
North Dakota	12	8	0	0	4	0	78,594	249	157	3	0	0	0	3	84	65
Ohio	20	11	0	5	2	2	56,336	589	597	1	0	0	1	0	6	6
Oklahoma	114	59	0	5	49	1	421,490	3,669	3,504	19	2	0	1	16	517	396
Pennsylvania	0	0	0	0	0	0	0	310	385	0	0	0	0	0	9	36
Texas	344	209	13	6	107	9	1,335,874	10,163	12,423	61	7	3	0	51	2,092	3,120
District 1	7	2	0	0	5	0	21,899	552	719	3	0	0	0	3	226	247
District 2	13	4	2	2	5	0	77,119	432	425	4	1	0	0	3	113	166
District 3	27	9	5	0	13	0	177,262	749	1,023	7	0	0	0	7	163	302
District 4	22	6	4	0	12	0	116,140	691	807	8	1	2	0	5	200	281
East	19	10	0	0	9	0	73,290	689	722	6	0	0	0	6	198	224
District 7-B	45	26	0	0	17	2	134,337	1,341	1,619	9	3	0	0	6	375	590
West	101	75	0	1	23	2	442,826	2,977	3,522	17	1	0	0	16	422	516
District 9	86	61	0	1	19	5	172,984	2,021	2,774	6	1	0	0	5	335	734
District 10	24	16	2	2	4	0	120,017	711	812	1	0	1	0	0	60	60
Utah	6	5	0	0	1	0	34,116	231	108	1	0	0	0	1	44	59
West Virginia	10	1	0	7	2	0	37,032	386	355	0	0	0	0	0	11	17
Wyoming	18	5	0	3	10	0	90,167	402	467	8	0	0	1	7	117	158
Misc. (Fla.)	1	0	0	0	1	0	10,993	56	57	1	0	0	0	1	48	40
Total U. S.	906	466	17	59	339	25	3,634,647	26,495	30,024	169	15	3	3	148	5,279	6,796
Prev. week	855	422	23	45	352	13	3,685,946	.....	.....	185	25	5	3	152	.....	.....
Cum. 1958	26,495	13,063	653	1,992	10,130	657	111,015,297	.....	.....	5,279	520	88	160	4,511	.....	.....
Western Canada	47	30	0	7	7	3	237,665	1,377	1,751	4	0	0	1	3	406	479

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



DAILY AVERAGE PRODUCTION FOR WEEK

	July 26, 1958			
	Crude oil	Lease condensate	Total	July 19 total
Alabama	17,700	.....	17,700	17,800
Arkansas	73,500	200	73,700	75,400
California	854,000	.....	854,000	852,400
Colorado	132,100	.....	132,100	132,800
Eastern	47,500	.....	47,500	42,300
Florida	1,275	.....	1,275	1,275
Illinois	226,900	.....	226,900	223,200
Indiana	30,800	.....	30,800	31,000
Kansas	†318,100	.....	†318,100	†335,400
Kentucky	41,900	.....	41,900	41,300
Louisiana	728,850	82,100	810,950	811,550
North	102,850	2,050	104,900	105,500
South	626,000	80,050	706,050	706,050
Michigan	24,100	.....	24,100	24,900
Mississippi	94,225	3,975	98,200	98,200
Montana	78,300	.....	78,300	77,600
Nebraska	54,100	.....	54,100	54,900
Nevada	100	.....	100	100
New Mexico	271,200	5,200	276,400	276,400
North Dakota	38,900	.....	38,900	38,600
Oklahoma	†572,100	.....	†572,100	†566,400
Texas	2,343,000	63,100	2,406,100	2,406,100
Dist. 1	43,000	400	43,400	43,400
Dist. 2	96,000	8,600	104,600	104,600
Dist. 3	327,000	31,000	358,000	358,000
Dist. 4	175,000	8,200	183,200	183,200
Dist. 5	26,000	300	26,300	26,300
Dist. 6	100,000	6,200	106,200	106,200
East Texas field	129,000	.....	129,000	129,000
Dist. 7-B	125,000	100	125,100	125,100
Dist. 7-C	122,000	4,150	126,150	126,150
Dist. 8	912,000	1,900	913,900	913,900
Dist. 9	185,000	1,600	186,600	186,600
Dist. 10	103,000	650	103,650	103,650
Utah	82,900	.....	82,900	83,500
Wyoming	320,200	.....	320,200	317,000
Others	‡175	.....	‡175	‡175
Total U. S.	6,351,925	154,575	6,506,500	6,508,300
Change from previous week, down			1,800	
Canada	†508,500	.....	†508,500	†492,500
Total U. S. production—January 1-July 26				1,336,697,400 bbl.
Same period last year (crude plus cond.)				*1,534,623,714 bbl.

*Includes 29,222,425 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

CRUDE-OIL STOCKS BY STATES OF ORIGIN*

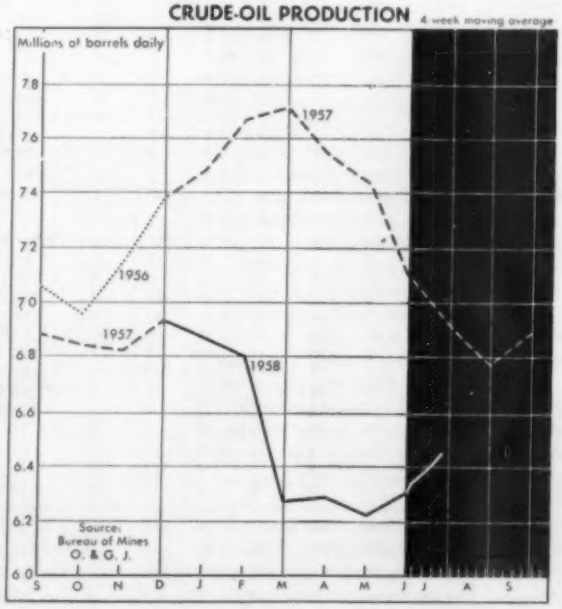
(Thousands of barrels)

	7-19-58	7-12-58	7-20-57
Pennsylvania	2,900	2,913	2,954
Other Appalachian	1,363	1,348	1,503
Illinois, Indiana, and Michigan	10,754	11,505	11,133
Nebraska and North Dakota	2,048	2,072	2,621
Kansas	9,968	9,560	11,433
Oklahoma	17,012	17,110	21,147
Arkansas	1,897	2,246	3,499
Louisiana	16,339	15,591	19,454
North	3,009	2,918	3,888
South	13,330	12,673	15,566
Mississippi, Alabama, and Florida	2,166	2,091	2,627
New Mexico	6,221	7,010	8,636
Texas	103,254	103,124	130,490
East Texas	7,202	7,330	10,177
West Texas	48,857	48,477	63,801
Texas Gulf	20,192	20,615	24,895
Other Texas	27,003	26,702	31,617
Wyoming	14,605	14,946	17,808
Other Rocky Mountain	9,435	9,241	6,572
California	38,073	38,462	29,348
Foreign	†15,685	15,590	16,657
Total	251,720	252,809	285,882

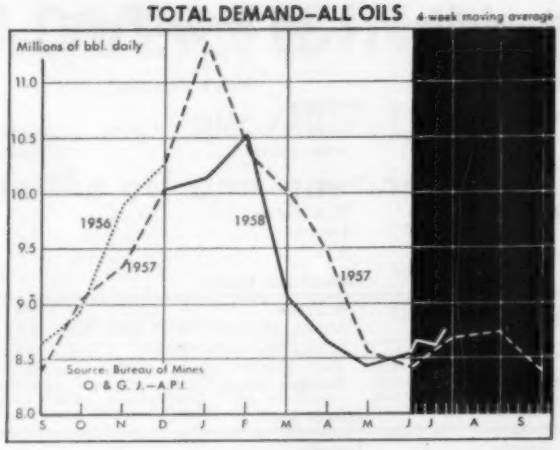
*Bureau of Mines. †Includes 4,976,000 bbl. in California.

CRUDE-OIL PRODUCTION

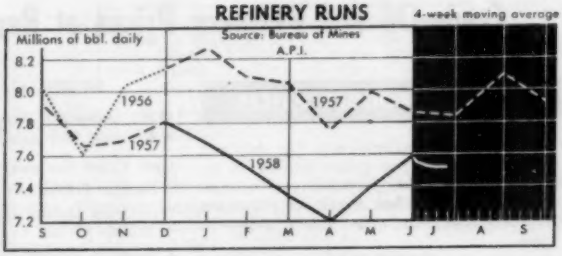
4 week moving average



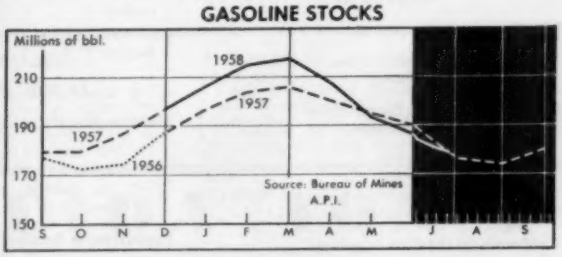
TOTAL DEMAND—ALL OILS 4-week moving average



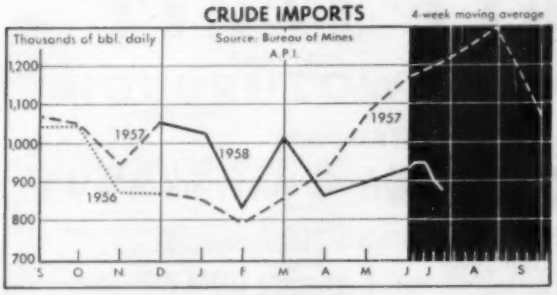
REFINERY RUNS 4-week moving average



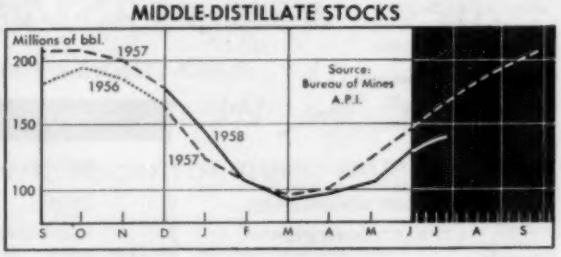
GASOLINE STOCKS



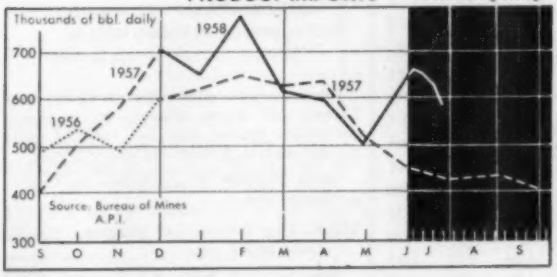
CRUDE IMPORTS 4-week moving average



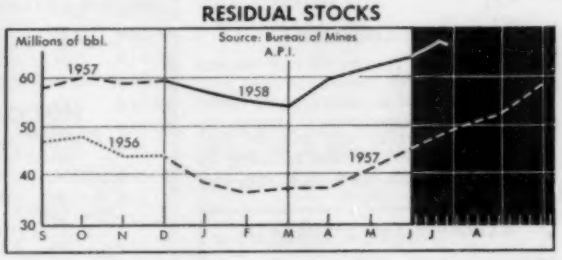
MIDDLE-DISTILLATE STOCKS



PRODUCT IMPORTS 4-week moving average



RESIDUAL STOCKS



API REFINERY REPORT—JULY 25, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1957: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	946	499.1	28.0	248.7	169.4	41,317	9,092	36,968	12,982	1,235	483.3	30.8	322.6	229.2
Appalachian:														
District 1 ..	73	31.7	.7	16.7	2.1	4,475	475	2,512	557	102	45.3	2.5	22.3	4.8
District 2 ..	103	57.9	5.4	15.9	9.6	2,338	478	1,146	334	48	26.8	2.4	6.8	7.1
Ind., Ill., Ky. ..	1,370	729.1	59.6	297.3	134.0	33,417	6,136	20,156	5,592	1,271	662.9	53.8	254.2	139.9
Minn., Wis., Dak.	117	52.9	4.4	31.1	16.1	6,842	1,373	6,406	610	104	48.7	5.6	30.2	8.2
Okla., Kans., Mo.	761	419.4	13.4	170.4	34.4	16,720	1,514	11,202	1,050	728	405.0	11.8	160.3	28.1
Inland Texas ..	284	203.3	6.4	50.0	19.6	6,562	351	1,779	2,055	278	212.3	8.5	49.6	20.6
Texas Gulf Coast	1,708	970.6	83.9	426.0	205.3	22,013	2,715	12,244	8,170	1,854	904.1	77.6	471.7	241.6
La. Gulf Coast .	636	407.4	17.9	170.7	34.4	9,202	1,520	4,886	1,505	668	361.1	45.5	169.0	45.3
N. La. and Ark.	99	36.6	5.0	22.2	8.0	4,566	1,000	2,183	159	97	34.7	5.6	22.4	6.7
Rocky Mountain:														
New Mexico .	19	8.3	1.1	4.3	2.9	482	16	131	73	26	13.7	0.1	6.2	2.3
Other Rky. Mt.	284	136.3	2.9	54.3	37.6	5,797	273	2,862	982	285	134.1	2.1	61.4	34.6
West Coast ...	1,117	513.7	1.9	172.4	315.0	25,077	395	13,082	32,418	1,156	500.5	2.7	172.9	321.2
July 25, 1958	7,517	4,066.3	230.6	1,680.0	988.4	178,808	25,338	115,557	66,487	7,852	3,832.5	249.0	1,749.6	1,089.6
July 18, 1958	7,450	3,929.9	257.7	1,609.4	984.4	179,556	25,631	113,483	67,199	.....	.....	.....	.....	.....
July 26, 1957	7,763	3,793.7	270.6	1,702.9	1,109.1	175,698	30,611	133,822	48,737	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	12.00-12.25
Premium (99 octane)	15.00-15.25

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.75
Regular (92 octane)	11.00
★ Premium (97 octane)	12.00-12.125
★ Premium (98 octane)	12.125-12.25

California (rack) (Los Angeles):

Regular (88 octane)	11.3-11.5
Premium (96 octane)	12.8-13.0
Premium (98 octane)	13.3-13.5

Caribbean area (cargoes):

Regular (87 octane)	10.375
★ Premium (97 octane)	12.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

★ Kerosine 42-44	9.50
★ Diesel oil (58 d.i. and above)	9.25
★ Distillate No. 1	9.25
★ Distillate No. 2	8.50

Gulf Coast (cargoes):

Kerosine 41-43	8.625
Distillate No. 2	8.375

New York Harbor (barges):

Kerosine 41-43	9.65
Distillate No. 2	9.15
Diesel fuel, 48-52 d.i.	9.75

Caribbean area (cargoes):

Distillate No. 2	8.375

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):

★ Residual fuel (max. 1% S)	$1.30-1.35

Gulf Coast (cargoes):

Bunker C fuel	$2.20-2.25

New York Harbor (barges):

Bunker C fuel	$2.57

Caribbean (cargoes):

Bunker C	$2.25

California (rack):

Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):

150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5

Pennsylvania Grade:

145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.§	Mid-Cont.*	Gulf Coast Tex..†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.36	....	....	....	....
15-15.9	2.41	....	....	....	$1.81
16-16.9	2.46	....	....	....	1.86
17-17.9	2.51	....	....	....	1.91
18-18.9	2.57	....	....	....	1.96
19-19.9	2.62	....	....	....	2.01
20-20.9	2.68	$2.75	....	$2.62	2.06
21-21.9	2.73	2.77	....	2.64	2.11
22-22.9	2.78	2.79	....	2.66	2.16
23-23.9	2.84	2.81	$3.44	2.68	2.21
24-24.9	2.89	2.83	3.46	2.70	2.26
25-25.9	2.95	2.85	3.48	2.72	2.31
26-26.9	3.00	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	....	3.05	....	2.92	2.83
36-36.9	....	3.07	....	2.94	2.87
37-37.9	....	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). Some Oklahoma buyers paying 10 cents less. †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:

Bienville (distillate)	$3.05
Ville Platte	3.45

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25

Illinois Basin	3.00

Canada:

Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:

Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.08

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):

Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23

Middle East, E. Mediterranean:

Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49

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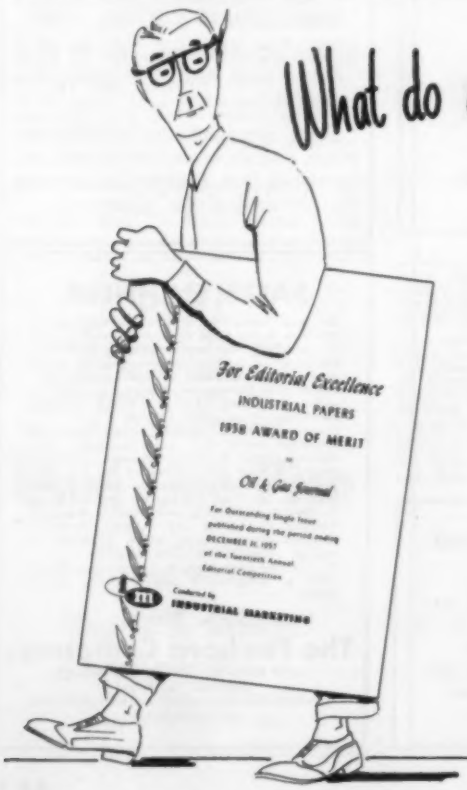

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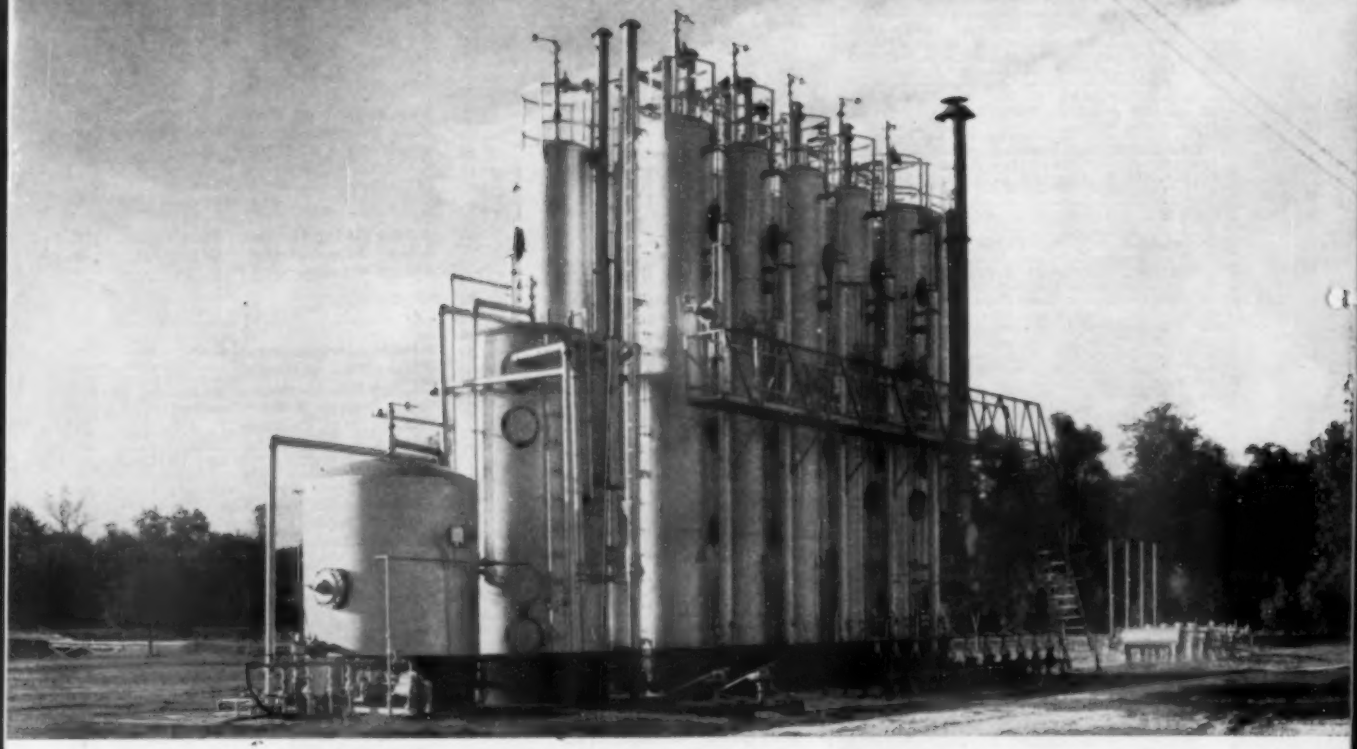
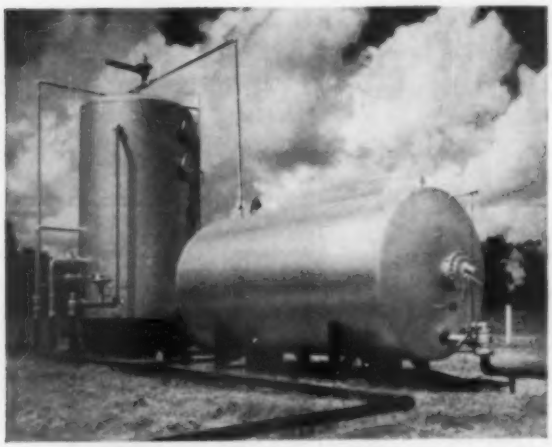
NATIONAL

CLOSED WATER DISPOSAL SYSTEM



Centralized treating battery of National Emulsion Treaters, a Vertical Water Conditioner and a Vertical Accumulator and Back Wash Tank in South Louisiana for a Major Oil Company.



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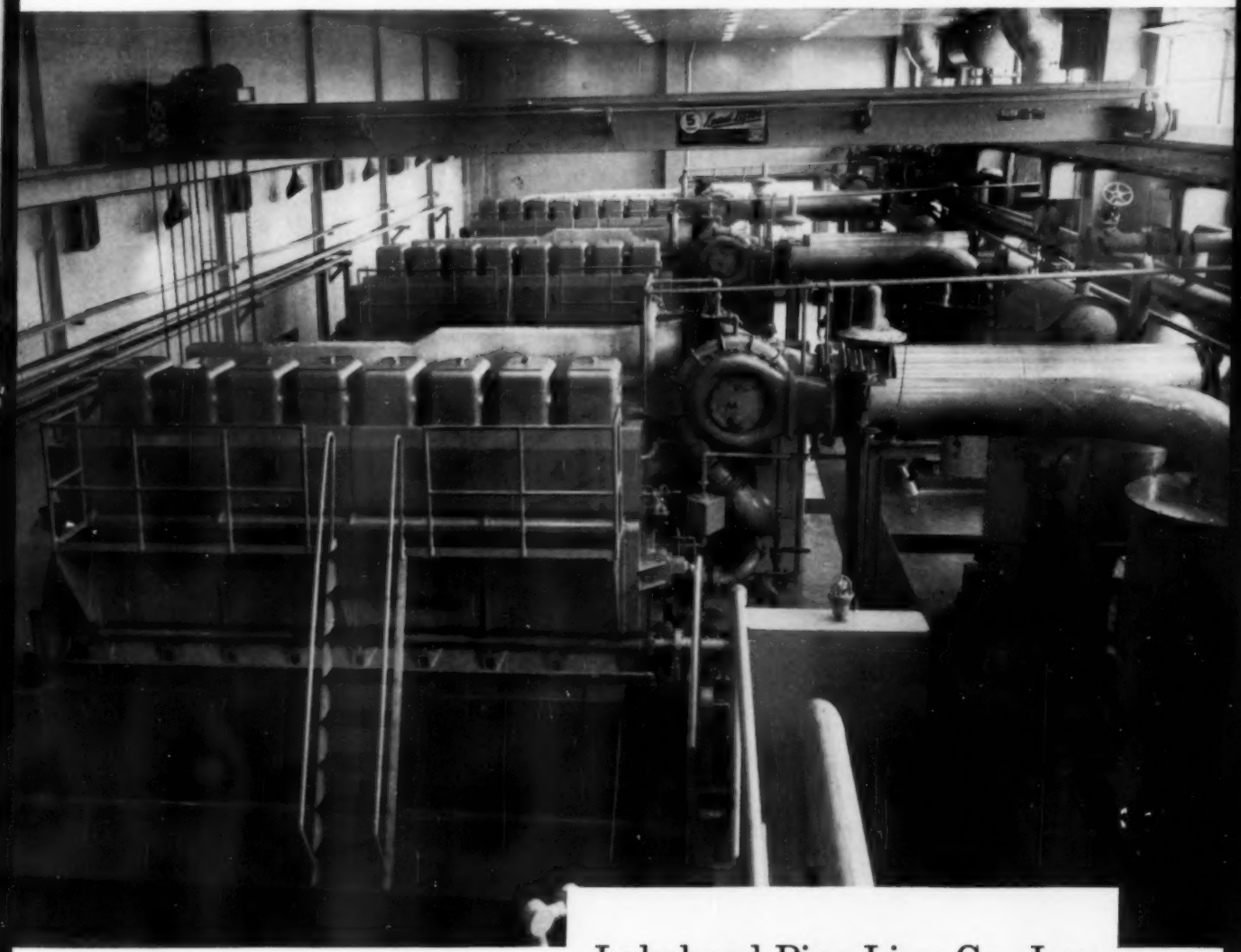

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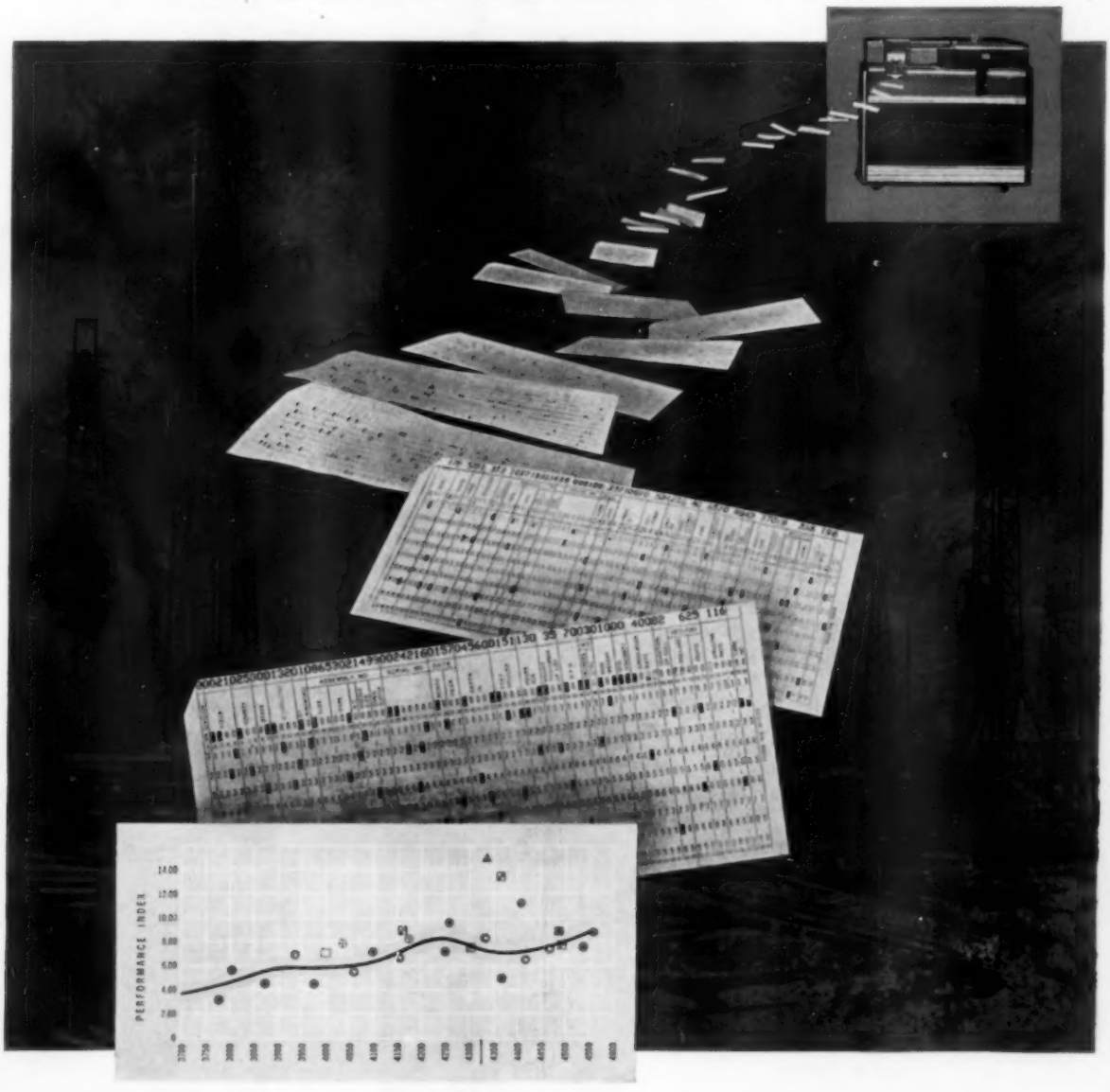

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